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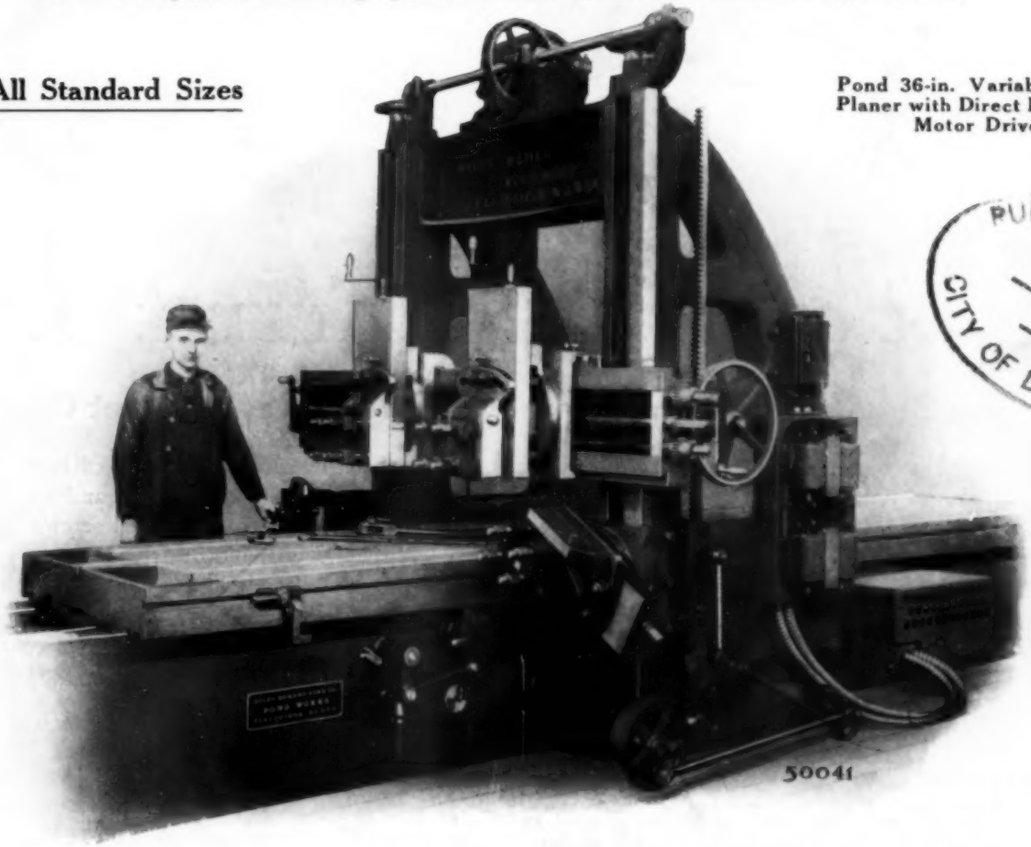

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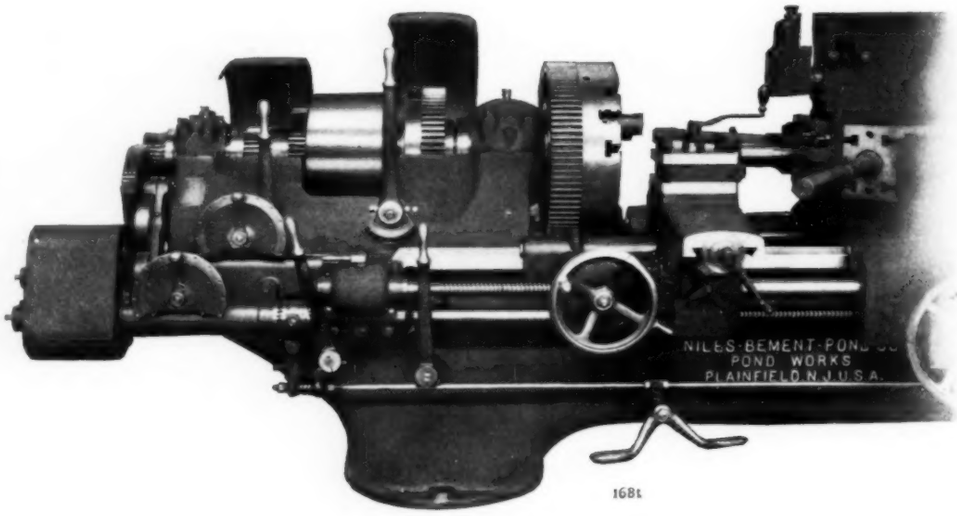

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(*See pages* 1, 43, 44, 45 *and* 46)

A Smith Shop with Water Gas Fuel

With the extensive improvements that are being made by the Lackawanna railroad are included some new shops at Scranton, Penn. These are located immediately back of its new station. The new shops include a machine shop, a boiler shop, a smith shop and a foundry, as well as a new power house and gas-producer plant. The ground on which they were built was for years used as the dumping ground for slag, cinders and other refuse that comes from blast furnaces, and, therefore, the building and machines have a good, solid foundation.

The smith shop, of which this article is a description, is 125 feet wide and 300 feet long. A general idea of its construction can be obtained from the interior view, Fig. 1, which shows about one-quarter of the shop.

The three rails that are shown to the left of the picture are laid down through the center of the shop, from end to end, and form a narrow-gage track for small shop cars and a standard-gage track for ordinary railroad cars. Underneath this track is constructed a subway that will be described later.

In the foreground of Fig. 1 is shown the elevator pit and stairway opening, both of which lead to the subway. The shop-car track is laid to and on the elevator so that carloads of work can be easily handled.

Editorial Correspondence

Layout of the shop in the different subdivisions that consist of departments for bolt-making, spring making and tool making and heat treating and also for frame forging and welding, small steam-hammer forging, large steam-hammer forging and drop-hammer forging. The large and small hammers and furnaces that are used, together with the various machines of the different departments.

A novel feature of this shop is the subway railroad that connects it with the many other shops of the plant. This subway has storage rooms, racks and bins so the raw material can be brought into and the finished product taken away from the shop without interfering with the work that is being carried on on the shop floors.

Spring Department

At the end of the stairway entrance is located a Reihle Bros.' testing machine, and to the right of that, against the wall, a Tinius-Olsen banding press.

Next to this is located a small spring-tempering furnace, in which 30 miscellaneous springs can be heat-treated in a day with the furnace maintained at a uniform temperature. Beside that and back of the end of the stairway is located a larger furnace for double springs, that has openings on opposite sides. This will heat all the work that two fitters can handle in a day's run. On each side of it will be located a faceplate for the easy handling of work.

Next to the larger furnace, immediately back of the partition between the stairway and the elevator, are located the tapering rolls. Immediately back of these is located a furnace, and beside that the punch and shears. These are used for tapering, punching and nibbing springs. Both of the machines are run with individual motors, which are of 10 horsepower and use an alternating current. This furnace also has an opening on both sides and a capacity sufficient to keep two fitters working. The corner of the shop back of these is fitted up with furnaces and hammers for doing the largest work that will be required.

General Layout

The layout of the smith shop is shown in Fig. 2. This shows where each machine, motor, furnace, forge and crane is placed, and the kind of each that is used. In the lower left-hand corner of the plant is located the bolt department. This department, with its bolt cutters,

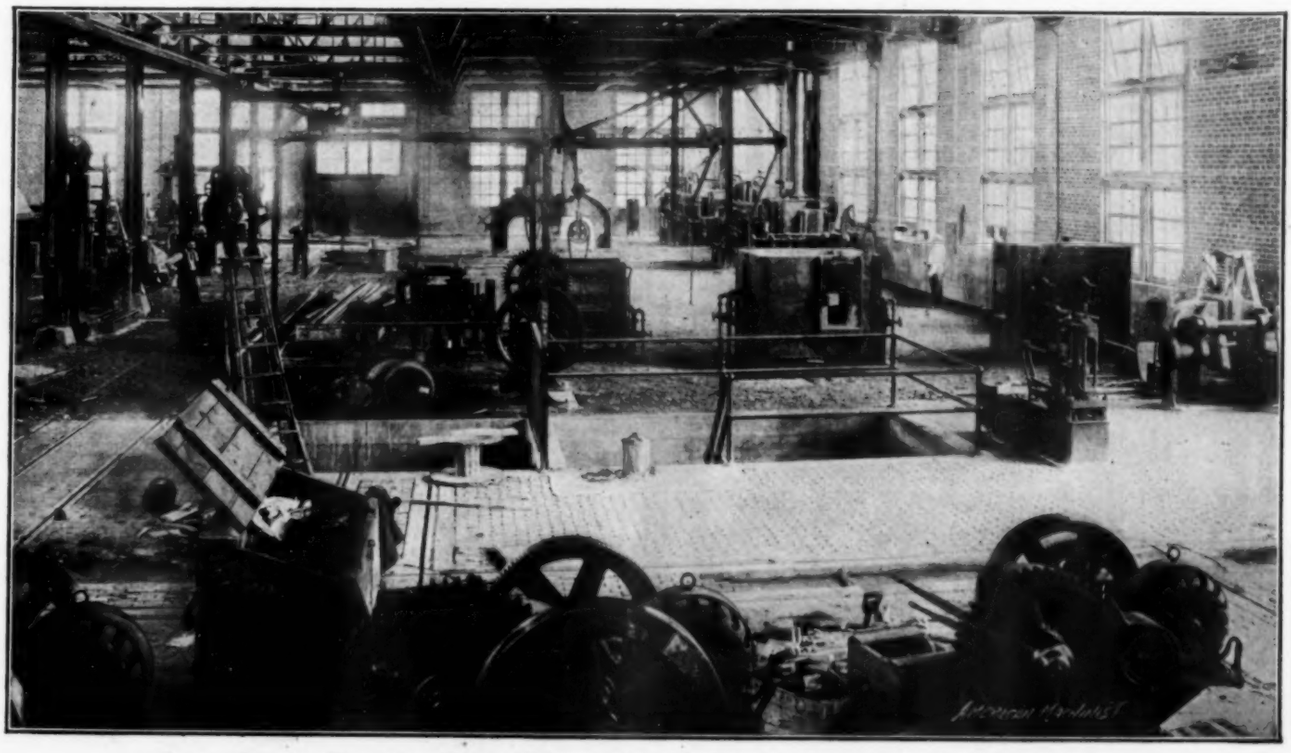


Fig. 1. Subway Entrance, Spring Forging and Big Hammer Forging of New Smith Shop

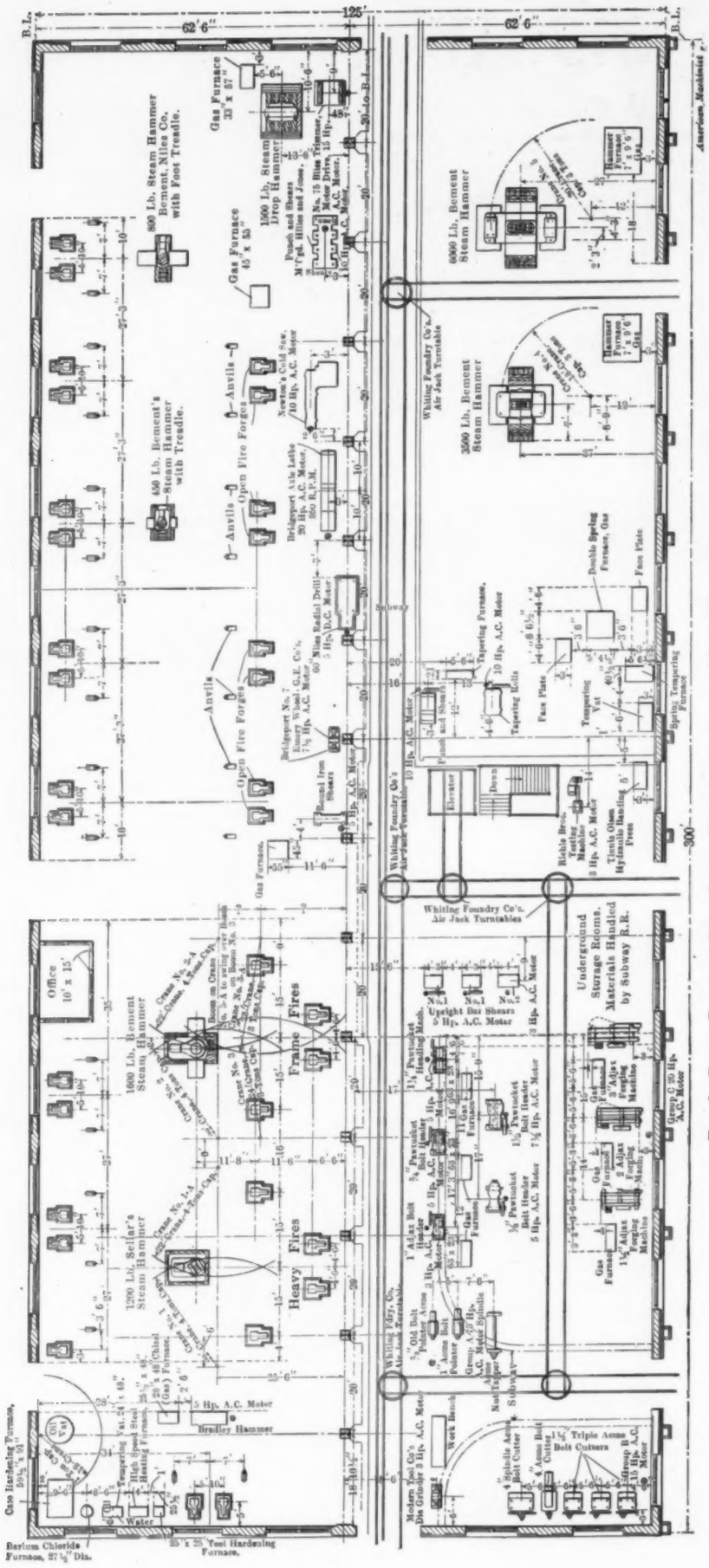

125'
62'6"
62'6"
Gas Furnace 33" x 87"
800 Lb. Steam Hammer Bement, Niles Co. with Foot Treadle.
1500 Lb. Steam Drop Hammer
Gas Furnace 45" x 55"
6000 Lb. Bement Steam Hammer
Whiting Foundry Co's Air Jack Turntable
3500 Lb. Bement Steam Hammer
450 Lb. Bement's Steam Hammer with Treadle.
Anvils
Open Fire Forges
Bridgeport Axle Lathe 20 Hp. A.C. Motor 360 R.P.M.
Newton's Cold Saw 10 Hp. A.C. Motor
Double Spring Furnace, Gas
Face Plate
Tempering Furnace, 10 Hp. A.C. Motor
Tempering Rolls
Tempering Vat
Bridgeport No. 7 Rotary Wheel G.E. Co's 7½ Hp. A.C. Motor
60" Niles Radial Drill 5 Hp. D.C. Motor
Round Iron Shears
Whiting Foundry Co's Air Jack Turntables
10 Hp. A.C. Motor
Pulley and Shears
Elevator
Down
Riehle Bros. Testing Machine 3 Hp. A.C. Motor
Tinnis Olsen Hydraulic Hauling 6' Press
Spring Tempering Furnace
Gas Furnace
Whiting Foundry Co's Air Jack Turntables
Underground Storage Rooms. Materials Handled by Subway R.R.
Office 10' x 15'
1600 Lb. Bement Steam Hammer
Crane No. 3-4 Cap. 4 Tons
Crane No. 2 Cap. 3 Tons
Crane No. 5 Cap. 3 Tons
Crane No. 1-4 Cap. 4 Tons
Frame Fires
1200 Lb. Seiler's Steam Hammer
Heavy Fires
No. 1 Upright Bar Shears 5 Hp. A.C. Motor
No. 2 Pawtucket Heading Mach.
No. 3 Pawtucket Bolt Header
No. 4 Pawtucket Bolt Header
No. 5 Pawtucket Bolt Header
1" Adax Bolt Header
1¼" Adax Bolt Header
5" Old Bolt Pointer
1" Acme Bolt Pointer
3 Adjt. Forging Machine
Group C 30 Hp. A.C. Motor
Gas Furnaces
Whiting Foundry Co. Air Jack Turntable
Oil Vat
5 Hp. A.C. Motor
Bradley Hammer
Case Hardening Furnace, 50½" x 91"
Tempering Vat 24" x 48"
High Speed Steel Hump Furnace 25½" x 48"
Chisel (Gas) Furnace 25½" x 48"
Water
Barium Chloride Furnace, 27½" Dia.
25" x 25" Tool Hardening Furnace
Modern Tool Co's Die Grinder 3 Hp. A.C. Motor
Work Bench
Subway
Group A 15 Hp. A.C. Motor
Triple Acme Bolt Cutters
Spindle Acme Bolt Cutter
4 Acme Bolt Cutter
1½" Triple Acme Bolt Cutters
Group B 15 Hp. A.C. Motor
American Machinist

FIG. 2. FLOOR PLAN ON NEW SMITH SHOP OF D. L. AND W. R. R. AT SCRANTON, PENN.

headers, forges, shears and furnaces, occupies about one-sixth of the floor space. Besides the main car track which runs along one side of the bolt department, a shop-car track runs through it to the elevator, so the work can be lowered into the subway and from there conveyed to the various shops where it is used or to the storehouses.

On the opposite side of the elevator is located the spring department, with its machines and furnaces, and in the lower right-hand corner is the heavy forging department, while in the upper right-hand corner is the miscellaneous forging department. This department occupies about one-quarter of the floor space and with the other machinery contains 18 open forge fires that are located in pairs with a hood over each pair to carry away the smoke, gases, etc.

Most of the upper left-hand quarter of the floor space is utilized for frame forging, welding, etc. This contains two large steam hammers, each being served with four large forge fires, and besides this five small forge fires and the foreman's office. The two hammers are each served with two swinging-jib cranes that will take the work from any of the four forge fires, back of each hammer, to the hammer or *vice versa*. The extreme corner of this end of the shop is used for tool hardening and dressing department.

THE SUBWAY

One of the main features of this shop, as well as the other shops of this plant, is the subway railroad that is used for conveying the work from one shop to another or to the storehouses and shipping rooms. The dotted lines in Fig. 2 show the location of the subway under the smith-shop. The main line runs lengthwise of the shop, to the machine shop on one end and the yard on the other.

Under the center of the shop, as seen in the lower part of the cut, are located rooms and bins for storing material. This covers considerable space and is reached by the elevator and stairway. Through the center of this storage room runs a branch subway that crosses the yards and enters the foundry. At the extreme left of the shop, underneath the bolt department, another branch of the subway runs through the yards and into the foundry.

With this system of handling work, the raw materials can be brought into the shop on the underground railroad and the manufactured materials can be taken out in the same way. Thus, the floor of the shop can be kept clear for the handling of work and not make it necessary to climb over freight cars, trucks, etc., in going from one side of the shop to the other. It greatly facilitates the handling of raw materials, as they can be brought into the yards on freight cars and dumped into the chutes that

FIG. 3. THE BOLT DEPARTMENT CONSISTING OF FURNACE AND HEADERS

convey them to the proper bins or rooms in the subway. From these they can be loaded into cars and conveyed to the various shops or departments for use.

FURNACES

The furnaces and their necessary fuel are very important factors in a shop of this kind, and the D. L. & W. R. R. spared no expense in investigating the different kinds and methods used. After a very thorough investigation and the accumulation of considerable data, the contract for furnishing the entire furnace equipment was given to the Rockwell Furnace Company, Havemeyer building, New York. The fuel decided on to operate these furnaces was water gas, and a plant for producing it was put in by Power and Mining Machinery Company, of New York, who installed the Loomis-Pettibone gas generating system. The details of the generation of gas by this system, with its cost and applications, will be given in a later article.

BOLT HEADING

The furnaces for heating bolts for the bolt-heading machines are shown in Fig. 3. They are open on both sides and serve five bolt headers that are located on both sides. The foundation in the foreground of the picture is for a bolt header; this one not having been placed when the protograph was taken.

The three furnaces each have a capacity of 1500 1½-inch and 2000 1¼-inch bolts, per day of 10 hours; or 3000 1-inch bolts with a reserve capacity for one more header; or 4000 ¾-inch and 5000 ½-inch bolts. The different sized headers are so placed as to take care of this furnace output. Each furnace has a large water-jacketed plate on both sides, in front of the heating chamber, to protect the operator from the heat. A pipe is located underneath each opening to the heating chamber, and this sends an air blast upward that carries the heat with it and drives it back of the water-jacketed plate.

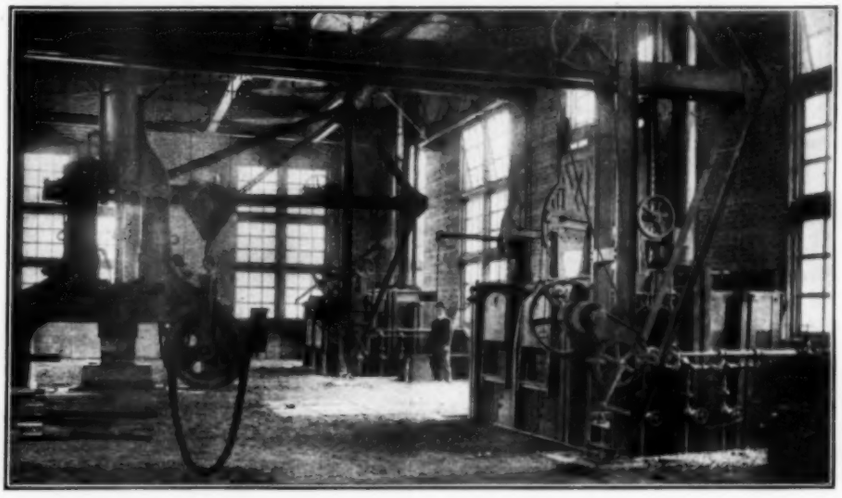


FIG. 5. FURNACE AND 6000-POUND HAMMER IT SERVES, WITH SWINGING CRANE

FIG. 4. FURNACES FOR BOLT-FORGING MACHINES

BOLT FORGING

The three furnaces that serve the bolt-forging machine are shown in Fig. 4. A 1½-, 2- and 3-inch Ajax machine will be located beside its respective furnace, these not being in place when the photograph was taken. The furnace and 1½-inch machines will be capable of heating and forging 4000 ¾-inch pieces and 1500 1½-inch pieces in the 10-hour workday. The 2-inch forging machine and its accompanying furnace will be able to handle 2000 1¼-inch and 500 2-inch pieces, and the 3-inch forging machine and furnace can handle 500 2-inch and 200 3-inch pieces in a day's run.

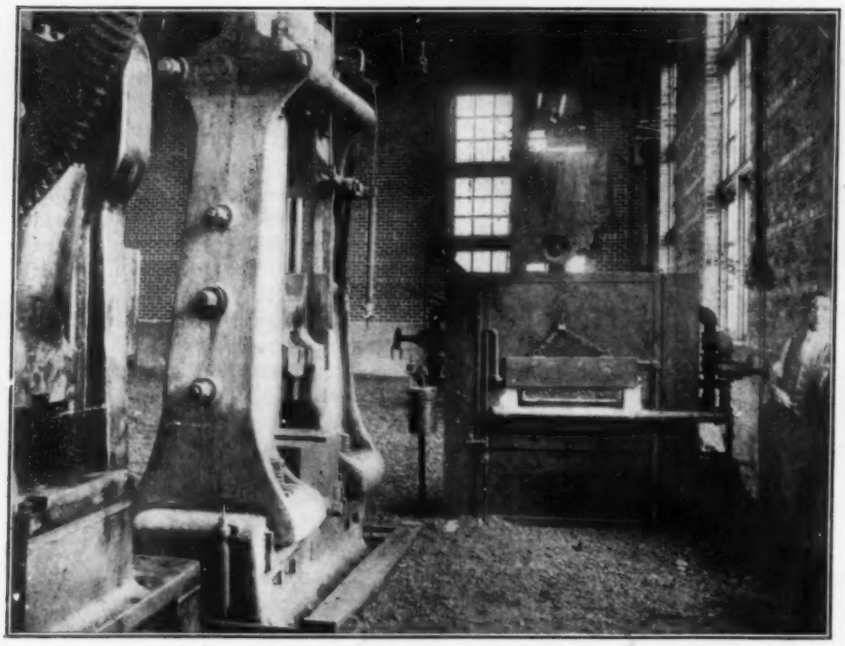


FIG. 6. FURNACE, HAMMER AND TRIMMER FOR DROP FORGING

LARGE FORGING

In Fig. 5 are shown two large furnaces in which work is heated for the two largest hammers; one of these hammers is shown, as well as the two cranes that carry the work from the furnaces to the hammers.

The furnace in the foreground is used in connection with a 2500-pound hammer that is called the scrap hammer. It is capable of handling five heats per day and has a capacity for 3600 pounds of steel per heat.

The furnace in the corner of the shop, in the rear, is used in connection with the 6000-pound steam hammer shown, for heavy forging work. This furnace and hammer can handle steel up to 18 inches square, or shafts up to 12 inches in diameter.

FIG. 7. FURNACES AND 800-POUND HAMMER WITH TRIMMER FOR MISCELLANEOUS WORK

The swinging-jib crane has been thought best suited for the work in this shop, and consequently adopted. Its construction and operation can be plainly seen in this picture. The same kind of crane is used in the frame forging and welding department in the diagonally opposite corner of the shop.

DROP FORGING

Across the car tracks from these big hammers, in the end of the shop, is located a drop-forging outfit, as shown in Fig. 6. To the extreme left of the picture is partly shown the trimmer that works in conjunction with the 1500-pound steam hammer shown next to it. The furnace and drop hammer are capable of working bars that are 5 inches square or under and then can handle these continuously all day.

In Fig. 7 is shown the 800-pound drop steam hammer with its trimmer and furnace. These are used on miscellaneous work, and the furnace also heats miscellaneous work for the 1600-pound steam hammer.

A front view of the furnace is shown in Fig. 10 and back of it are shown the

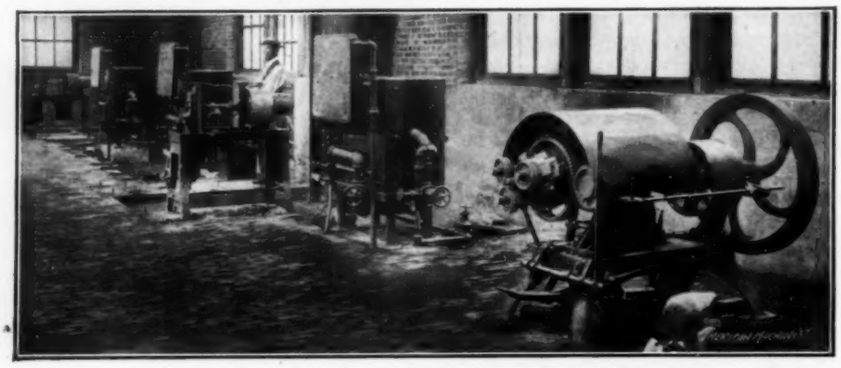


FIG. 8. TUBE-WELDING MACHINES AND FURNACES

open-fire forges, that are located in pairs with a hood over each pair.

TOOL HARDENING AND FORGING

The corner of the shop that is used for the tool department is shown in Fig. 9. In the extreme corner to the right of the picture is situated a large case-hardening furnace. Immediately in front of it a concrete vat has been built in the ground to be used for an oil tempering bath. Immediately over this vat will be located one of the jib cranes, of one-ton capacity, to handle the metal worked in the furnace and vat.

In the background, next to the case-hardening furnace, will be seen a barium chloride furnace, for high-speed steel, with a hood over it. In front of this is located an ordinary gas furnace for high-speed steel, and to the left of that is a furnace with three small openings, in which to insert cutting tools to heat them for hardening or tempering.

In the extreme left hand of the picture is shown a gas furnace with a water-

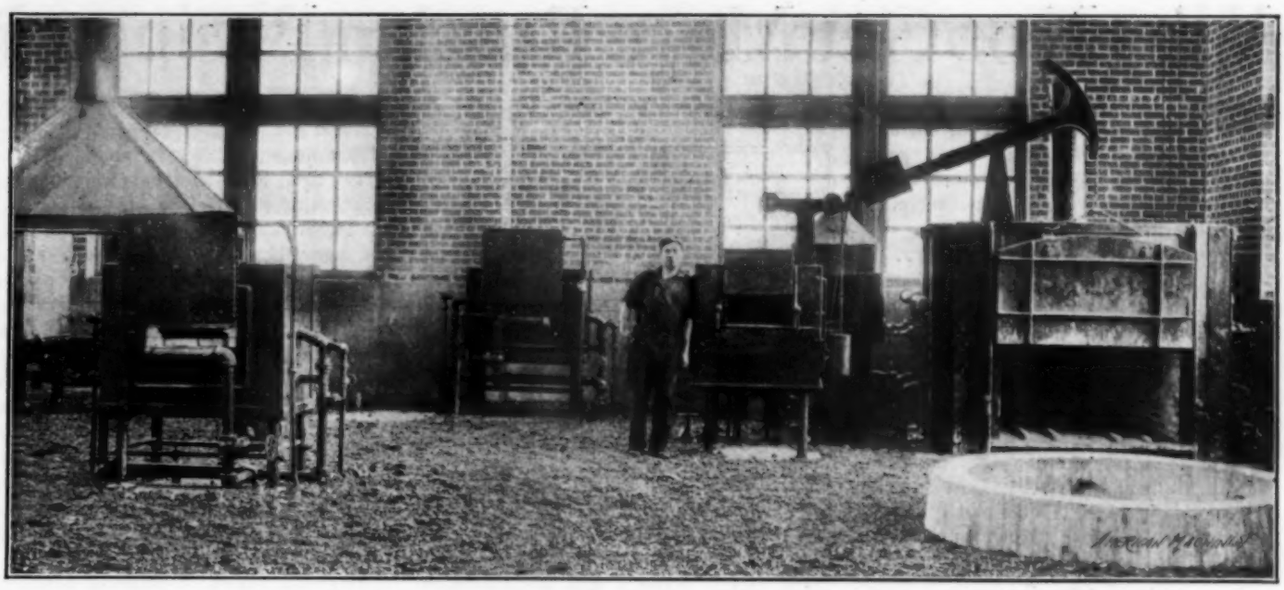


FIG. 9. THE TOOL-DEPARTMENT CORNER AND APPARATUS

jacketed shield. This is used for work forged in the Bradley hammer that is next to it but not shown. Immediately back of this are two open-fire forges, the end of one of which is shown, with a hood covering both of them.

The furnaces and machines shown in Fig. 8 are located in the boiler shop and are used for flue welding. Each machine with its accompanying furnace has an average capacity of 80 welded tubes per hour.

In Fig. 11 is shown a large boiler plate heating and annealing furnace. This is

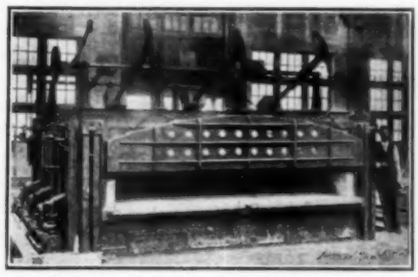


FIG. 11. FURNACE FOR ANNEALING BOILER PLATE

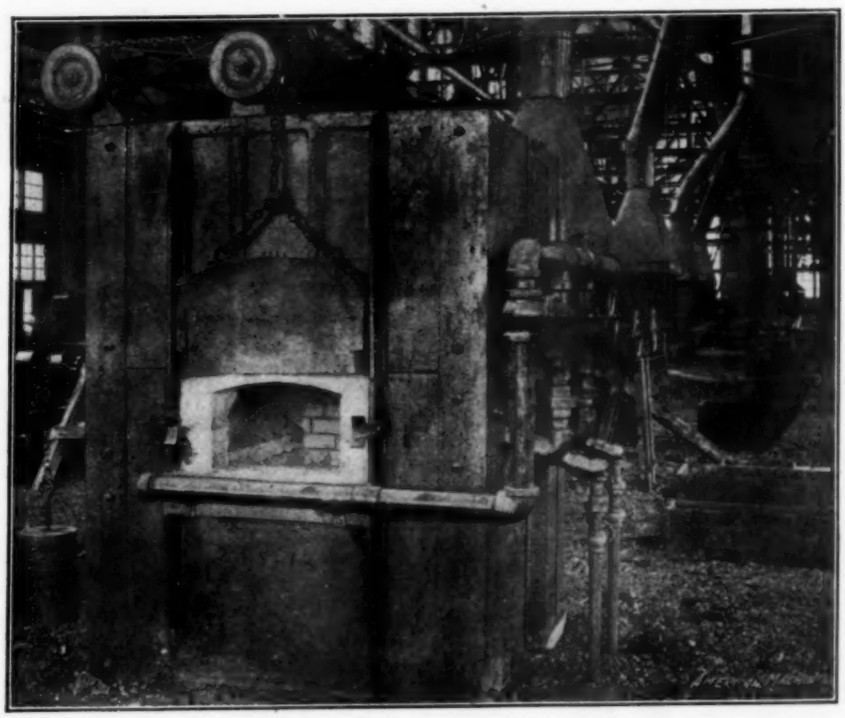


FIG. 10. FURNACE FOR MISCELLANEOUS WORK. OPEN FIRE FORGES IN THE REAR

open on both sides and has a pneumatic door-raising device.

The shop as a whole shows a systematic method in placing the machines and furnaces, as well as in handling the raw materials and the finished work. The results that will be obtained in turning out work will, therefore, doubtless be economical to a degree that will make it pay to keep watch of this shop and obtain the data on output after it has been running long enough to operate smoothly.

The results obtained from this installation, and the cost of operating it, as compared with the more usual equipment, should be of general interest.

A look at the screws of wooden hand clamps and iron clamps in use around the ordinary machine shop, is enough to make a boy strike his daddy. The wood screws, or a good share of them, will be found with the thread badly worn or stripped at the point where the wear of the screw has been the greatest, probably at that point of the screw which bears when the clamps are open about two inches.

It is time well spent to keep tabs on the hand screws and clamps and weed out defective ones and put them where no time will be lost in trying to use them.

New screws can be purchased for a very small sum and they may be put into the clamp heads as required.

Iron clamps are liable to much the same defect; the screw may become bent, the body of the clamp twisted or the conical washer may be broken or lost. Clamps once twisted out of line are worth about as much as a cipher with the rim off. Be careful that time is not wasted over them in your shop.

Why Not Get More Russian Business?

By Vincent J. Mac Intyre*

In spite of her troubles, Russia presents splendid business opportunities for those who are willing to get acquainted with the conditions and profit by them.

A strong appeal for active work in securing a fair share of Russian trade by a man who is on the ground and knows what can be done.

*Kastornoje, Russia.

After a two years' experience in all parts of Russia in mechanical lines, I am impelled to write the following, in the hope that it may, in a small measure, help in the good work of securing more Russian trade. Somehow or other the American manufacturers must be brought to a realization of what they are losing in not getting into the Russian market with both feet.

The American consul general in Moscow is at the present moment endeavoring to bring about the establishment of an American-Russian bank in that city. This is a decided step in the right direction, but all the banks this side of the Atlantic will not help to sell American goods, if the makers do not do their share in the effort.

Your quotation from the report of Consul Lester Maynard in Vladivostok, page 478, is a timely word, but it does not go deep enough into the matter. It is a lamentable fact that American manufacturers are annually losing to Germany and France hundreds of thousands of dollars' worth of good Russian trade, solely because they are not properly represented here.

This applies not alone to machine tools and small tools, but to power and hand wood-working tools, and everything else that would come under the general term of hardware. Pages could be written on the opportunities awaiting Americans here in a dozen different lines—but to confine the subject to machine tools and allied products.

It is universally admitted here by the Russians themselves that America provides the best in these lines, but in spite of that one finds the country flooded with German, French and Belgian goods, which the people buy because they cannot get other. In the few instances where American products are sold direct into this country, the credit is all due to progressive Russians who realize the facts and make special efforts to get American agencies.

American firms make a radical mistake in putting their representation into the hands of people in the above-mentioned countries who are in nearly all cases manufacturers of similar goods themselves. It is true, the firms at home get *some* goods marketed, and no doubt with a minimum of trouble to themselves, but they also get the best of their goods copied and put on the market here as "American pattern." Thus they not only lose in direct sales, but "A. p." being synonymous with "inferior quality," the real American goods suffer in the long run (and often in a short run too), the average user here not being able to distinguish the near thing, as it looks so much like it. And when the "A. p." fails, as it usually soon does, everybody and everything American gets damned.

I had occasion to buy hand wood-working tools in Kieff, and asked for American tools only. Some I got and some I did not, and for the latter had to send to London.

A hustling Russian salesman spent ten minutes trying to convince me that an "A. p." ratchet brace was better than the real thing, and called to his aid a German traveling salesman, who was in the store at the time and who happened to be the very man whose firm turned out this and several other "A. p's." I was not convinced, but I took the brace because I had to have it, and for the same reason reluctantly took a set of "A. p." wood bits.

I did find a real Stanley combination plane; to the Russian, a wonderfully fine and complicated creation, which would sooner find its way into the corner of his room along with the other ikons than into his shack of a carpenter shop. But there were no Disston saws, no real chisels, no clawhammers—in fact, none of the ordinary things used in every-day wood butchery. And why not? Why was that drummer not an American? Why, in the epidemic of building that is going over Russia at the present time, is only "made in Germany" hardware to be seen?

The average man in America thinks of Russia as a place exclusively devoted to Socialism, cholera and terrorism, but the fact is that here are more good business opportunities than in all the rest of Europe.

If, after a year's stress of business, the rushed American manufacturer who has had a new bit of energy scrubbed in at Karlsbad (and has put up for three days at the Hotel Adlon, and "seen" Berlin), instead of at once hiking back to the old grind, would cable the treasurer for another 500 and make a round trip through Warsaw, Kieff, Moscow and St. Petersburg, he would see things that would set him thinking, and he'd lie awake a few nights wondering why he had not come here before and got acquainted.

That is the secret in five words. *Come here and get acquainted.*

Then he would hustle home, and get a few live, Russian-speaking American salesmen off on the first fast boat.

If American firms want to get a foothold here they must have direct, active representation, and not trust to having their goods pushed in this market by European firms who are already competitors in the same lines. And they have got to do it quick, or else merely be content with the crumbs that are falling from a richly laid table, while the enterprising lords of production from other lands have already finished the soup and are beginning on the fish.

Wheel Cost a Small Item

In many grinding operations the wheel wear (the first cost) is a mighty small item of expense when compared with the actual cost of operation, in which we must figure the horsepower consumed, labor, machine investment and the production.

In order to obtain a fair idea of the "cost of wheel," an accurate record was kept of a grinding operation on a 10x72-inch Norton plain machine. The work was grinding 35-point carbon open-hearth machinery-steel shafts from the black stock, taking off 1/16 of an inch, reducing from 1⅜ inch diameter to 1 5/16 inch. A 15x2-inch, 24-L alundum wheel was used and in 10 hours' work it showed but 0.270 inch wear. The wheel was trued once at the start and once at the end of six hours. Work speed, 25 feet a minute; wheel speed, 6100 feet a minute; table reverse, 12 feet a minute. That means a wheel cost of but a very few cents a week.

It is not good policy, therefore, when endeavoring to reach maximum grinding economy to let the purchase price of a grinding wheel stand in the way of a larger production. Instead of thinking too much about "wheel cost," due consideration should be given to the other factors of cost—labor, which must be figured at from 60 cents to $1 an hour; the horsepower consumed in grinding; the production necessary to make the grinding-machine investment a profitable one and the many advantages of rapid production. These are the factors that must be weighed carefully when purchasing grinding wheels. Compare them with the "wheel cost."

Economy consists in getting the right wheel for the work and operating it under the most favorable conditions, and the original cost of the wheel in most cases is too small an item to take into consideration.—*Grits and Grinds.*

Ball Bearings in Machine Tools*

By Henry Hess †

Applications of ball bearings to drills, millers, planers, punch presses, cold saws, woodworking machinery and cranes, from both American and German practice.

*Presented before the New York convention of the National Machine Tool Builders' Association.

†President, Hess-Bright Manufacturing Company, Philadelphia, Penn.

It is always a more or less difficult matter for any engineer who is also actively engaged in business and interested in the financial side of his output to confine himself to a strictly technical discussion and leave aside the commercial features. As I believe, however, that this association was, in the last analysis, founded to take care of the commercial interests of its various members, I frankly state here that my interest in taking up your time is also, in the last analysis, a commercial one. I recognize, however, that commerical success can be based only on sound work and good engineering. You will all agree with me that the final proof of both is that of actual practice. For that reason I shall present to you no disquisition on the merits of ball bearings in general or of the various types and designs, but shall content myself with referring those of you who are interested to various papers* I have read before the American Society of Mechanical Engineers. I shall present to you simply a number of illustrations, showing ball-bearing installations on various machine tools, taking these from American as well as European practice.

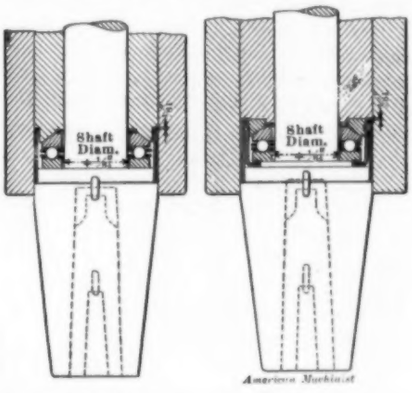


FIG. 1. FIG. 2.

TYPICAL ARRANGEMENTS FOR BALL-THRUST BEARINGS FOR DRILL SPINDLES

DRILL PRESSES

One of the oldest uses for ball bearings in machine tools is on the vertical spindles of drill presses; such use has been successful or its reverse, as proper bearings, properly mounted, have been used or not.

The Colburn Machine Tool Company showed at Atlantic City and elsewhere a heavy drill press that drove a 1½-inch drill through 31 inches of cast iron per minute, and a 3½-inch drill through 11¼ inches per minute—that means a pretty heavy thrust. This thrust was taken on Hess-Bright ball bearings of the self-adjusting seat type.

I may say here that whenever I refer to some particular product by name, it is either with the direct permission of the firm in question or by permission implied in the fact that my statement is taken from their publications; in other words, I make it a strict rule never to make public without express authorization any information, drawings or sketches of what my customers are doing.

Figs. 1 and 2 show typical arrangements for taking the thrust of drill spindles.

In Fig. 1 the parts of the bearings are not held together as a unit and the compensating seat is made in the end of the sleeve.

Fig. 2 shows a bearing of the caged type that handles as a complete unit and contains also the convex compensating seat washer. In both arrangements a sleeve forming an oil well to keep the balls submerged is employed.

Fig. 3 shows a radial-drill column with the weight taken on the thrust bearing at the top. It is preferable to take this weight at the top on a ball bearing placed there rather than on a ball bearing placed at the lower end of the column. This is because the relatively small bearing at the top costs only a small portion of what a ball bearing big enough to surround the column would come to. In order to relieve the friction due to the pressure that the sleeve exerts at the base of the column in a radial direction, this pressure is taken on one or more radial ball bearings, inserted as is shown in the larger vertical section; the smaller-scale horizontal sections show one, two, three or four of such bearings arranged around the column; these small bearings also cost much less than a single large one and are quite as efficient.

In the swinging-arm type of radial-drill bearings are employed at the top and bottom to take the radial thrust and a compensating-seat thrust bearing is placed at the bottom to take the vertical load.

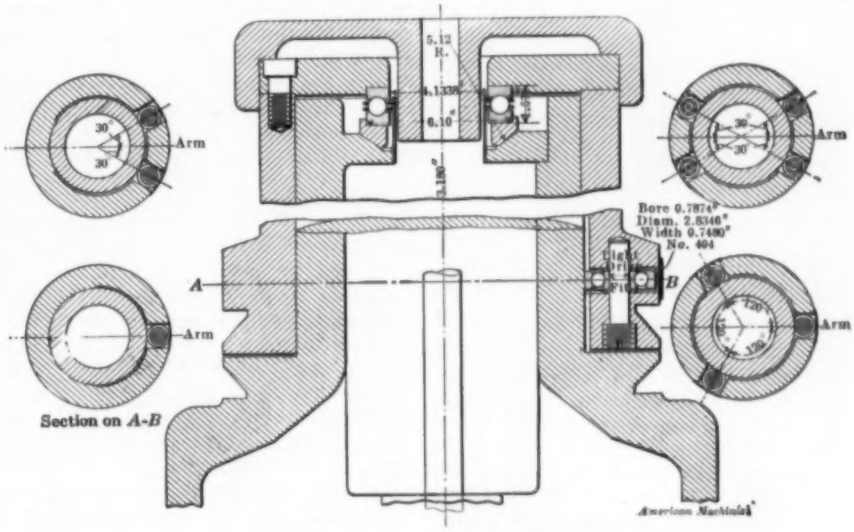


FIG. 3. BALL BEARINGS FOR RADIAL DRILL

MILLING MACHINES

Fig. 4 is a reproduction from German practice in taking the thrust of the table-elevating screw on a ball bearing. The Becker Milling Machine Company, on page 9 of its catalog on belted vertical milling machines, shows a "speed box equipped with Hess-Bright ball bearings." Other prominent American specialists in this line take the feed-screw thrusts on ball bearings.

PLANING MACHINE

Fig. 5 is reproduced from a description in the "Zeitschrift des Vereins Deutscher Ingenieure" of a heavy worm-driven 144-inch planer. It will be noted that the two thrust bearings for taking the worm

*"Discussion of Ball Bearings," December, 1906.
"Ball Bearings," May, 1907.
"A Journal Friction Measuring Machine," June, 1908.

thrust both on the cut and reverse stroke are quite conveniently mounted and housed in a cap at the end of the worm-gear case. It has been found that the correct employment of suitable ball bearings does away with all liability to back lash from worn, plain steps, and considerably increase the ease of running of the planer and of its power efficiency.

Grinding Machines

In the American Machinist, page 700, is shown a vertical spindle of a surface grinder, built by the Blanchard Machine Company, of Cambridge, Mass. The

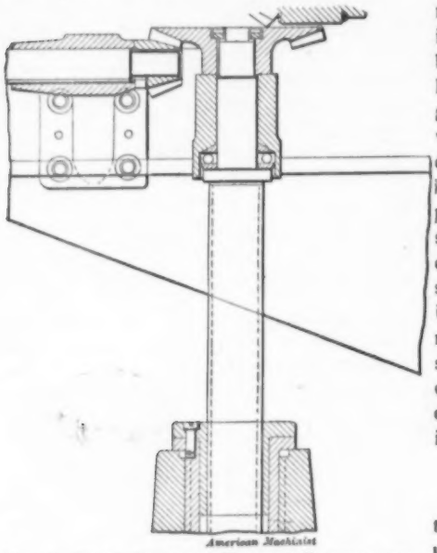


Fig. 4. Ball Bearing Taking Thrust of Milling-machine Elevating Screw

weight of the spindle is taken at the top on a thrust ball bearing, as is the radial load at this point on a radial, while the grinding thrust is taken just immediately above the face-grinding wheel, on a thrust bearing.

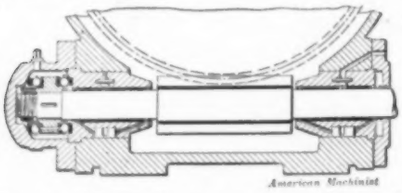


Fig. 5. Ball Bearings to Take Thrust of Worm in Planer Drive

Fig. 6 shows the entire countershaft of a German grinding machine, mounted on ball bearings. The ends of the boxes have been left open in order to show the bearings, but in use these ends are, of course, inclosed. This machine is built by Unger, of Stuttgart.

In our own shops we also have remounted a number of our grinding-machine countershafts, as well as the wheel spindles on ball bearings. We have found that, whereas on the original plain bearings the belts were frequently thrown off when suddenly starting the machines, the substitution of ball bearings entirely stopped this. In addition all the various annoyances due to wear and the necessity for frequent lubrication have been done away with.

Mr. Hanson, of the Pratt & Whitney Company, was kind enough to permit me to refer to his use of ball bearings on one of his very heavy grinding machines; Fig. 7 shows the entire load of a 10-inch and 7-inch belt taken on two ball bearings.

Fig. 8 shows a direct motor-driven grinding head in which the wheels are carried at the ends of the spindle, mounted on ball bearings.

The Rushmore Dynamo Works has mounted a very considerable number of its grinding and buffing heads on our ball bearings, after having first thoroughly tried them out for durability and other good qualities before going into the conversion of practically all of their machines to this form of mounting. Fig. 9 is typical of one of the arrangements employed. Mr. Rushmore has expressed his surprise to me that builders of this machinery do not regularly so mount their spindles and rather reflected on our ability as salesmen. Possibly Mr. Rushmore's strictures would have been less severe if the task had been his of overcoming the prejudice due to earlier inefficient types of ball bearings and their injudicious use.

Punch Presses

In the examples heretofore considered the ball bearings have been employed under conditions of fair uniformity as to load and at speeds ranging from the moderate ones of cutting tools to the higher speeds of grinding machines. That ball bearings are used with very decided success also under conditions of considerable shock is evidenced by a heavy power press or punch in which the flywheel or drive shaft is mounted on a ball bearing.

This example is a fairly heavy press as is indicated by the large driving-gear weight of a ton. Carefully made comparative tests on this press showed that ball bearings decreased the idle stroke power by 54 per cent. The power required for the plain bearing during the working stroke was 16.8 horsepower which reduced to 13 horsepower on the ball bearing. The total time required for one working and one idle stroke, that is, for one cycle, was 13 seconds, of which one working and one idle stroke, that is stroke. The power saving for the complete cycle was 40 per cent. This press has now been in use for a number of years and the ball bearings do not yet show the slightest indication of wear.

Rolling-mill Tools

The proposition was put up to us one day of improving the performance of certain very heavily stressed cold disk saws. The plain bearings required renewal about once every three weeks and that renewal necessitated also a re-turning of the shaft itself and naturally put the machine out of commission for some time. This disk ran at 4100 revolutions per minute and required 20 horsepower for the drive and would, when thrown on, almost stall the motor and frequently blow the fuses; a stream of cold water was kept continually running through the water jackets of the babbitted bearings. Since the machine has been changed to our ball bearings a 7½-horsepower motor substituted for the 20 horsepower has

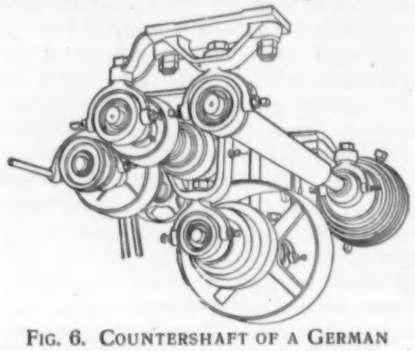


Fig. 6. Countershaft of a German Grinder Fitted with Ball Bearings

ample reserve and readily picks up the saw on the first point of the starting rheostat and without shock. While the user of that machine stated he would be satisfied if he had to renew the ball bearings once in three months he has now had the machine running for over a year and has been unable to notice the slight-

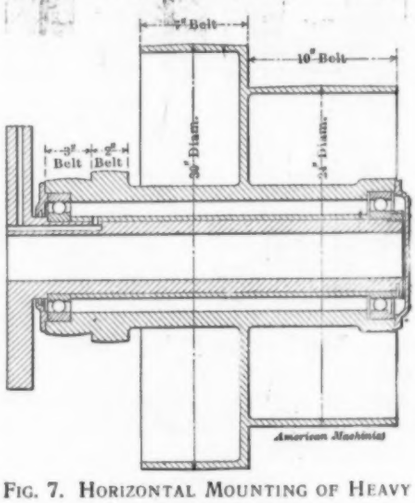


Fig. 7. Horizontal Mounting of Heavy Pulley for Grinder

est deterioration in the bearings; he is now engaged in remodeling his entire equipment.

Woodworking Machinery

One of the largest European woodworking machinery concerns is Fleck & Sohne, of Berlin. From their first tentative use of a few Hess-Bright ball bearings they have gradually extended this use until now of 159 types some 80 types are mounted on ball bearings. This firm considers the matter of such vital importance that its catalog reads very much like the catalog of a

ball-bearing manufacturer. Carefully conducted tests have shown that the power savings on the idle run amount to 60 per cent.; and under cut the actual horsepower saved is greater, owing to the greater load on the bearings.

In addition to power savings Fleck and others cite as fully as important the facts that wear is very much reduced, that all danger of bearings heating is eliminated, and that the consumption of lubricant is greatly reduced.

The Hoffman band saw is also mounted on these ball bearings.

Among American woodworking machine builders, the Defiance Machine Works mounts an 18-inch spoke lathe on these bearings and tells us that with the original babbitted bearings 2 horsepower was required to run the cutter head idle and 7 horsepower was required while turning an 18-inch spoke; mounted on ball bearings the reduction was from 2 horsepower to 0.8 horsepower for the idle running and from 7 horsepower to 5.8 horsepower while under cut.

The Advance Machinery Company tells us that it considers a dovetailing machine one of the most difficult of woodworking machines to deal with; further, that while trouble was had with the dovetailer to a very considerable extent before the substitution of our ball bearings, not a solitary complaint has since that change been received. You will believe me when I say that I most heartily concur with and strenuously hope for an early consummation of their prediction that it is "only a question of time when woodworking machinery manufacturers will adopt these ball bearings entirely." This concern has adopted them also for its shapers and other machinery.

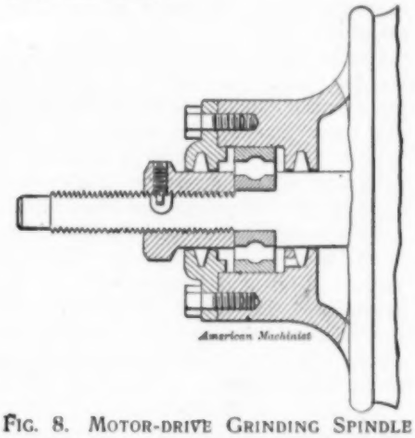


FIG. 8. MOTOR-DRIVE GRINDING SPINDLE MOUNTED OVER BALL BEARINGS

A somewhat peculiar condition of affairs attends the introduction of ball bearings in that many of those who employ them ask, in the first place, for an exclusive right to use them on their machines as against their competitors and then, as that is not possible, ask that no mention be made of their employment, in order that their competitors may be kept in the dark as long as possible. Naturally I find this condition irksome since it largely prevents my using that most effective of all arguments with a competitor, but must, of course, respect the request.

SHAFTING

Shafting is an essential portion of every machine tool, possibly not so much as concerns the main line, but certainly as to the countershafts. I have on other occasions described tests, showing economy of power and also have described the form of hanger that I have developed to permit the fullest realization of the benefits of the ball bearing on shafting. Recent papers* read before the American Society of Mechanical Engineers reciting carefully conducted efficiency tests may be referred to by those actively interested. You will note that the hanger is no longer the usual foundry job, but is a good example of machine-tool design; all of the various supporting surfaces are machined. The usual rib construction has

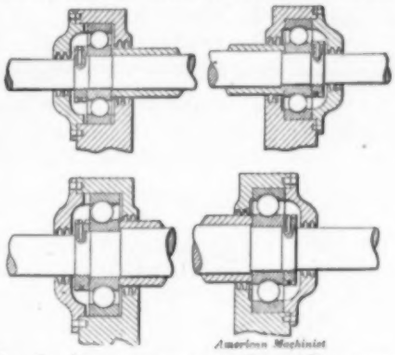


FIG. 9. ARRANGEMENT OF BALL BEARINGS FOR BUFFING AND GRINDING HEADS

also been departed from in favor of the far superior box sections current in your own practice as machine-tool designers and builders. Used as a countershaft this hanger is equipped with a lug for the attachment of the shifter fork supporting arms, that can be set at any angle.

My first employment of these ball bearings was with the German Niles Tool Works Company, of Berlin; I there mounted the entire line of countershafts on them. This was feasible without entailing greater costs than with plain bearings, in that I employed only three sizes for the whole range of tools. To do that I necked down the ends of the heavier shafts; this was permissible without a weakening of the shafts since the ball bearing itself is so short as to bring in no bending moments at all, but stresses the shaft at the resultant shoulders practically only when in shear.

CRANES

Those of you who build cranes will tell me that ball bearings are too rich for your blood; some of you may also be candid enough to tell me that you won't buy ball bearings just to save for the other fellow. I leave it to your customers to instil a proper respect for their interests. Fig. 10 shows German practice in a trolley and hook for a ton load and again in a swing-crane column with the ball bearings loaded to 10 tons horizontally and 14½ tons vertically.

Special ball bearings you can get to suit any demand, even should you insist on the 400,000 pounds that some other fellows have asked for and have not been

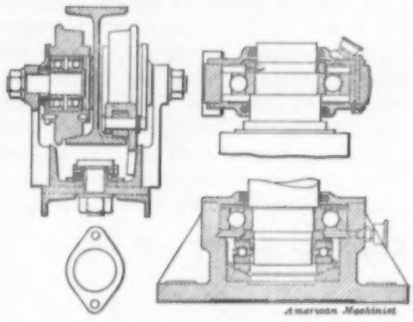


FIG. 10. GERMAN PRACTICE IN BALL BEARINGS FOR CRANE TROLLEY, HOOK AND SWING COLUMN

denied after due establishment of their credit.

Bench Drawers for Assemblers

The small shop which is expanding so fast that it outgrows itself almost every month, must pass through some experiences which are not always pleasant, either for the superintendent or his workmen.

The shop which is the subject of this paragraph, is passing through such a transformation and much trouble is and has been, experienced among the machine assemblers, by the disappearance of files, small machine parts and other tools and stock belonging to the company.

Evidently things were done on an army basis by the workmen, where the men who miss or lose anything are slow to report the loss thereof because they know that it will be charged up against them on the next muster and payroll. Instead of reporting the loss and drawing a new article, the loser thereof proceeds at the first opportunity to steal from his neighbor the desired item of accoutrements.

The same tactics prevailed in the shop in question and as a temporary relief, the superintendent devised a plan of drawers, fastened under the bench of each workman. The drawers were made large and commodious and were nicely fitted upon slides. After they were put in place, each workman was required to provide a lock and key at his own expense, which were placed upon his individual drawer and each and every night all the tools used by him in assembling and all the small machine parts which belonged to his bench, were to be placed in the drawer.

*"Lineshaft Efficiency, Mechanical and Economic," December, 1909.
"Ball Bearing Lineshaft Hangers," June, 1910.

Valve Timing of Automobile Engines

By C. T. Schaefer

A discussion and digest of current practice in the setting and timing of the inlet and exhaust valves of automobile motors, with tables showing what prominent American and Foreign builders are doing.

Considerations of inertia of the gases, and time allowance for expansion to produce flow, dictate that inlet valves should open and close late, and that exhaust valves should open early and close late.

Timing of the spark.

What follows is a discussion of the valve setting of prominent French and American gasolene motors. The table of French motors must be credited to *Motor Age*, as it appeared in that publication some time back, when the Larrad timing device was being described by Mr. Hayward.

The data on American motors were collected by the writer and include some engines designed by himself. There are some 30 engines mentioned in the list, representing the best foreign practice, while the list of American engines consists of large and small sizes as well as high- and low-speed, long- and short-stroke motors, all using gasolene as fuel.

Closing of Exhaust and Opening of Intake

For convenience, the strokes will be considered as they occur in the cylinder, starting with the inlet, or suction stroke. The closing of the exhaust, which occurs just before the intake opens, and the opening of the intake are the most delicate points of the analysis. The logical point of the exhaust closing would seem to be on top center, and then opening the intake immediately afterward, but some good reasons can be advanced for closing the exhaust past the top center and judging from the motors listed, these reasons are borne out in practice.

It has been shown that the piston cannot drive the exhaust gases out of the cylinder, except by compressing them to a degree in excess of that existing in the exhaust ports and manifold. This excess of pressure may be very feeble, but it is indispensable. At the end of the piston travel on upper dead center this pressure still exists, no matter how little it may be, so that if the exhaust valve be closed and the intake opened at this instant, the pressure will prevent the entrance of fresh gas. Worse than that, the exhaust gases will penetrate the intake manifold. The tendency in this direction is not accentuated, however, because the piston rapidly begins to aspirate, but it is none the less evil on that account.

It has also been demonstrated that it is advantageous to have a slight vacuum in the cylinder before opening the intake. This is accomplished by keeping both valves closed for a short period, slightly decreasing the pressure existing in the cylinder, due to the increasing volume of the cylinder.

In short-stroke, high-speed motors the exhaust should close and the intake open at the earliest possible moment, in order to admit the charge to the fullest extent possible. The exhaust should also open at the earliest possible moment to allow the spent products of combustion to escape, as the time factor in a high-speed motor, for the exhaust, is very small. This is essential to get the maximum power from the engine. We have now discussed the exhaust closing and intake opening, and what has been said about both can readily be certified by referring to the tables given.

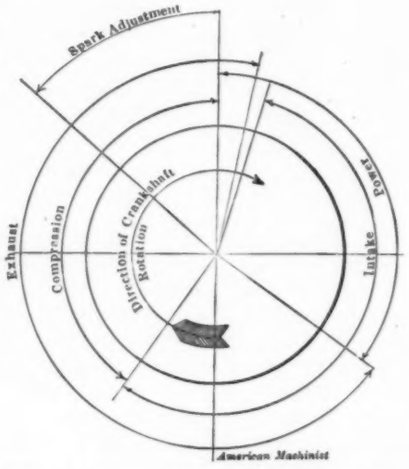


Fig. 1. Timing Diagram for Gasolene Engine

Closing of the Intake

Closing of the intake is almost always past the bottom center, as there are a number of advantages to be gained by this, although some few are given that are to the contrary. For high-speed engines the inlet should remain open for a fraction of the compression stroke, owing to the inertia of the incoming gases being greater than the impulse to drive them out by the returning piston. By making the inlet overlap the end of the stroke, a full charge is also assured, and the engine given a higher mean effective pressure, than if the valve were made to close just at the dead point. It will be noticed that on the low-speed motors the intake is closed sooner than on high-speed motors, as these motors invariably have a higher compression and a longer stroke, making a longer time factor in closing.

Lengthening of the period of intake opening in each cylinder of multicylinder engines tends to minimize pressure fluctuations in the mixture-supply system, carbureter and manifold, and therefore creates a better set of carbureting conditions. A late closing also assists in securing flexibility and thermal efficiency.

Opening of the Exhaust

Exhaust should open before the end of the power stroke, as it does in two-cycle motors. Just when to open the exhaust is a matter that is not easy to settle upon, and that it will not be the same in all designs of motors, is a matter that is to be taken for granted. In a long-stroke motor, for illustration, while it would do no harm to open the exhaust early (very early, indeed), the advantage in doing so would be slight. In short-stroke motors the advantages of an early opening are assured but disadvantages are also present. The faster a motor turns, all things being equal, the greater the amount of advance it is necessary to give the exhaust valves. It is a self-evident truth that if the speed of the motor be doubled, it travels twice as many degrees in a given time necessary to lower the pressure.

It is impossible to lay down an absolute law, but, generally speaking, it seems that the slowest motors shown in the tables are those having the maximum lead. Why? Simply because it is essential in designing a fast motor, to allow large openings for the valves and large piping, and these may compensate for the diminution in the lead given the exhaust valve. It must be recognized on the other hand, that the more the expansion is prolonged, the less the possible advance, and the less noisily will the gases effect their escape.

Designers at the present day prefer larger valves and smaller lifts, to obtain a quieter-running motor. With the small valves formerly used, the lift would be too great to make a high-speed motor either durable or silent, as the hammering would be excessive.

Crank Arrangement in Four- and Six-cylinder Motors

So far the discussion has dealt with the timing of single-cylinder motors, Fig. 1 being a diagram of the conditions. In

	Cylinder No. 1	Cylinder No. 2	Cylinder No. 3	Cylinder No. 4
Firing Order: 1-2-4-3	Firing.	Compression.	Exhausting.	Intaking.
Firing Order: 1-3-4-2	Firing.	Exhausting.	Compression.	Intaking.

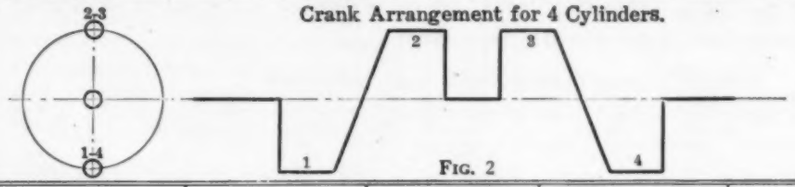
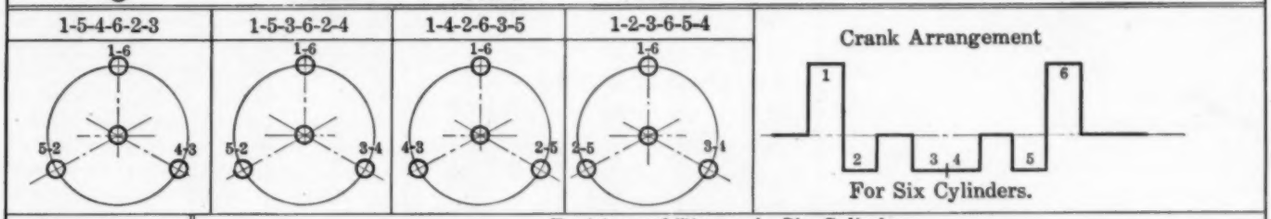


FIG. 2



Firing Order.	Positions of Pistons in Six Cylinders.											
	Cylinder No. 1		Cylinder No. 2		Cylinder No. 3		Cylinder No. 4		Cylinder No. 5		Cylinder No. 6	
1-5-4-6-2-3	Top C.L. Begining to Fire		1/3 from Top C.L. on Compression		1/3 down from Top C.L. on Intake		1/3 down from Top C.L. on Intake		1/3 from Top C.L. on Compression		Top C.L. Ex. Closing In. Opening	
1-5-3-6-2-4	"		"		"		"		"		"	
1-4-2-6-3-5	"		1/3 down from Top C.L. on Intake		1/3 from Top C.L. on Compression		1/3 from Top C.L. on Intake		1/3 down from C.L. on Intake		"	
1-2-3-6-5-4	"		1/3 from Top C.L. on Compression		1/3 down from Top C.L. on Intake		1/3 down from Top C.L. on Intake		1/3 from Top C.L. on Compression		"	

American Machinist

FIG. 3

CRANK ARRANGEMENT AND PISTON POSITIONS IN FOUR- AND SIX-CYLINDER MOTORS

a motor having more than one cylinder, it will be understood that the timing relations will be the same for any number of cylinders, but the firing is fixed with equal increments of time elapsing. This is all that has to be taken into account, except that the firing order, when given, must be observed.

In Fig. 2 is shown the crank arrangement for four-cylinder engines, with the two possible firing orders given: 1, 2, 4, 3, and 1, 3, 4, 2. In Figs. 2 and 3, operations are uniformly started at cylinder No. 1.

In four-cylinder engines the cranks are 180 degrees apart, as shown, and since cranks 1 and 4, and 2 and 3, have coincident axis, 2 or 3 may be taken as the next cylinder to fire after No. 1. The four-cylinder diagram, Fig. 2, gives the cycles as they occur with either firing order, while in the six-cylinder diagram, Fig. 3, the position of the piston also has been given to simplify the diagram.

With six cylinders, however, while the remark above regarding coincidence of events in the layout is true, there are two choices for second and third firing. Therefore, there are four possible firing orders, as follows: 1, 2, 3, 6, 5, 4; 1, 4, 2, 6, 3, 5; 1, 5, 3, 6, 2, 4 and 1, 5, 4, 6, 2, 3.

In six-cylinder motors the cranks are set 120 degrees apart and the diagram, Fig. 3, shows the relative positions of cranks and pistons with the above firing orders.

IGNITION

Ignition upon American cars is invariably provided with adjustment so that it can be advanced or retarded to suit

Name	H. P.	Number of Cylinders	Bore and Stroke. Inches.	Exhaust Opens Ahead of Bottom Center Line. Degrees.	Intake Closes Past Bottom Center Line. Degrees.	Exhaust Closes Past Top Center Line. Degrees.	Intake Opens Past Top Center Line. Degrees.	Ratio of Conn. to Crank. Radius.	R. P. M. At Full Power.
Mandsly	....	6	9 x 9	43	31	4	27	...	550
Speedway	..	4	.....	40	14	6	12	...	..
Olds	..	1	.....	38	5	10	19	...	....
General Electric Co.	..	4	6 x 6	40	16	8	10	...	900
Gas Engine & Power Co.	..	4	6 x 6	40	20	10	on Top line	...	900
Electric Veh. Co.	..	4	5 x 5	45	50	15	20	...	....
Wolsely	..	6	9 x10	38	27	5	23	...	430
General	..	8	8 x 7	40	30	on Top line	9	...	....
Am. Mors. K	40	4	4.92x5.91	39	20	8	10	2.7	1050
Am. Mors. L	30	4	4¼x 4	40	20	8	10	6	1050
Moon C	30	4	4¼x4¼	39° 45′	26° 15′	12° 30′	26° 15′	4.5	1800
Standard Six	50	6	4½x 5	40	15	10	15	4.	1200
Kansas City Truck	..	..	.....	47	34° 30′	11	14° 30′	.....	.....
Simplex	..	..	.....	40	on Bottom line	on Top line	40	.....	.....
Mercedes	..	..	.....	32	" " "	18	on Top line	.....	.....
Continental	40	4	5x 5	40	30	12° 30′	16	.....	.....
Railroad Motor	..	4	10x12	15	5	5	10	.....	350
Franklin	..	..	.....	12	30	on Top line	5	.....	.....
Am. Mors. A	18–24	4	3.43x4.92	39	on Bottom line	" " "	11	2.5	1200
Am. Mors. B	24–32	4	4.25x5.91	40	" " "	" " "	10	2.65	1200
Am. Mors. C	40–52	4	4.72x5.91	36	" " "	" " "	8	2.7	1050
Embree McLean	35	4	4½x 5	43	20	9	20	3.5	1200
Maxwell Mod. L	12	2 Horz.	4½x 4	40	40	10	15	.....	1200
" " H	16	2 "	5x 5	40	40	10	15	.....	1000
" " Q	18	4	3¾x 4	40	40	10	15	.....	1400
" " M	26	4	4¼x4¼	40	40	10	15	.....	1200
" " K	40	4	5 x 5	40	40	10	15	.....	1200

TABLE I. VALVE SETTINGS OF AMERICAN AUTOMOBILE MOTORS.

the performance of the motor, provided the energy of the spark is adequate for the purpose. It can readily be understood that the spark must be advanced as the speed of the motor is increased, independently of any other considerations, and as the motor slows down, the spark must be retarded to suit the lowering speed.

Referring to Fig. 1, it is desirable to notice the direction of crank-shaft rotation and then observe the direction of spark advance and of retard. It will be seen that the spark advances against the rotation of the crank shaft, and that in retarding the spark is late, since it follows rotation of the crank shaft. In advancing the spark, it is the purpose to locate the ignition at some angle on the compression stroke, preceding the power stroke, such as will allow the mixture to ignite and inflame before beginning of the power stroke.

Name	H. P.	Number of Cyl.	Bore and Stroke. Inches.	Exhaust Opens Ahead of Bottom Center Line. Degrees.	Intake Closes Past Bottom Center Line. Degrees.	Exhaust Closes Past Top Center Line. Degrees.	Intake Opens Past Top Center Line. Degrees.	Ratio of Conn. Rod to Crank Radius.	R. P. M. At Full Power.
Ours	..	..	.....	55	20	on Top line	15	4.76	1000
Charron	20–30	..	.....	44	0	" " "	1	4.55	1100
Rossel	40	4	.....	38	23	" " "	2	4.29	1100
Gregoire	10–14	4	.....	53	0	" " "	5	4.18	1200
Motobloc	24	4	3.94x4.72	45	10	5	10	4.75	1200
Panhard	..	..	.....	45	40	on Top line	on Top line	4.5	1200
Hotchkiss	..	4	3.74x3.94	44	33	10	17	4.27	1300
Cottin Disgeuttes	18–22	..	.....	46	30	8	15	4.15	1300
Brauhot	12	4	2.95x4.33	45	45	on Top line	20	5.	1300
Cornillean Ste Beuve	20–30	..	.....	56	20	6	20	4.62	1300
Mutell	40	..	.....	62	21	28	26	4.4	1300
Berliet	22	..	.....	48	38	20	17	4.5	1300
Peugeot (Paris)	18–24	..	.....	58	18	on Top line	10	4.76	1300
Labor	20–30	..	.....	51° 20′	0	" "	on Top line	4.18	1300
Luc Court	..	..	.....	45	0	15	30	4.25	1300
Brasier	..	..	.....	45	25	on Top line	7	4.5	1350
Peugeot (Beaulieu)	..	..	.....	51° 30′	58	20	15	4.78	1400
Aster	0	..	4.13x4.72	40	40	on Top line	on Top line	4.3	1400
Rochet Schnieder	24	..	3.94x4.72	40	20	" " "	20	4.75	1400
De Dion Bouton	12	4	.....	45	45	" " "	on Top line	4.7	1400
Eudelin	..	..	.....	36	20	4	8	4.3	1450
Farcot	14	..	3.15x3.94	36	10	2	6	4.	1500
Chenard Walcker	..	..	.....	36	36	on Top line	on Top line	5.25	1500
Darracq	10–12	..	3.94x3.72	48	30	" " "	" " "	4.5	1500
Aries	14–18	..	.....	58	44	13	18	4.91	1500
Vinot Deguingaud	21–16	..	3.15x4.33	30	15	on Top line	15	4.54	1500
Sultan	9–12	4	2.95x4.33	58	42	14	2	4.55	1600
Renault	8	2	.....	32	26	10	23° 30′	4.33	1600
Unic	20	..	2.95x4.33	53	40	10	34	4.5	1650
Sizarie Nauden	15	..	4.72x4.33	44	37	on Top line	15	5.25	1700

TABLE II. VALVE SETTINGS OF FRENCH AUTOMOBILE MOTORS.

The following might be stated about ignition: In a long stroke, low-speed motor, reduce the angle of ignition advance; while in a short-stroke, high-speed motor, increase the angle of ignition advance. With an adjustable spark it follows that running conditions, depending upon speed and the quality of the mixture will be between 20 and 45 degrees.

In Conclusion

In a general way the tendencies are as follows: Lag of exhaust closing to be reduced as the stroke of the motor is increased (in length), and if the crank-shaft speed is relatively low, lag of inlet opening will be reduced as stroke is lengthened and speed of crank shaft reduced. Lag of exhaust closing to be increased as the stroke is shortened, or the crank-shaft speed is increased. Lag of the inlet opening to be increased as the stroke is shortened, or the crank-shaft speed is increased.

As the stroke is lengthened and the speed reduced, the spark must be retarded, and when the stroke is shortened and the speed increased, the spark must be advanced. Putting it in a general way it is a case of balancing the gains against the losses.

Change Wires Occasionally

By J. F. Hobart

Around machines, where flexible cord is used for a light inclosed in a wire cage, trouble will sometimes be occasioned through current leakage from one wire to the other. I have in mind one building in which the wires are incased in wood-lined, iron-pipe conduits, which are usually run just under the ceiling. It is evident that at some point in the line one of the wires has become grounded upon the pipe conduit, for it is impossible to touch the pipe and the ground at the same time without receiving a considerable shock. Whenever the light socket is touched by the hand, while standing on a damp floor, the current will be felt with a force which is decidedly uncomfortable. Whenever a line is thus found short circuited, the thing to look out for is a short circuit between the flexible wires.

When lights are used as above noted, around machines, the wires are sure to become quite warm, and it is only a question of time when the light you are using will suddenly go out, but relight itself immediately when moved to a new position. It will require twice the trouble, if you do not know the trick, to determine the cause of a light becoming extinguished in this way, but frequently you will discover a small spark between the strands of the flexible cord, or wire. This spark appears and disappears with great rapidity when the light is moved to a slightly different position.

The cause of this is the burning out, or wearing off of the insulation between the strands of flexible cord. The contact between the wires is not sufficient to cause a dead short circuit, but little by little the insulation will be worn away, and the contact will become greater and greater, until, finally, the fuses are burned out and perhaps the flexible wire itself is cut in two by the current.

When a light is noted to behave like this, it is high time that the wires leading to the light be changed for new wires which are known to be insulated. It requires only a few minutes time to replace the end of every light connection which is liable, in any way, to be moved from one place to another. The renewal of wires will thus prevent an exasperating blow out of the fuses, and perhaps the burning out of the flexible cord itself. If short-circuited wires be left hanging in their insulated covering, they may be thrown carelessly to the floor or bench and cause a severe grounding which may cause a dangerous fire.

Machining Power Punch Presses

By F. A. Stanley

How punch-press frames, rams and slides are planed, milled and tested by means of simple but efficient fixtures.

The gages and tools employed, the methods of setting work and locating cutting tools, the application of templets and other forms of gages.

Unusual methods of handling castings on the planer and milling machine.

Some features of the practice of the Willard Machine and Tool Company, Cincinnati, Ohio, in the construction of their power presses are illustrated by the accompanying halftone engravings.

Planing Press Frames

In order that the seats for the ram slides shall be perfectly square with the bed of the press, a fixture shown in Fig. 1 is used on the planer for holding the frame of the press during the entire series of planing operations. This fixture is a simple affair with uprights at each corner, fitted with clamping screws for holding the work, while on the bottom of the fixture base there are two sets of grooves for tongues for the slots in the planer table. The grooves are exactly at right angles to each other and after the planing operations are completed with the fixture placed lengthwise of the table as illustrated in Fig. 1, it is turned crosswise of the platen without removing the work and the bed is then planed square with the other machined surfaces.

Some Useful Gages

A number of setting and testing gages are used on this work and these are shown in Figs. 1, 2 and 3. After the vertical seat for the ram slides has been roughed out and one side has been finished, a handy setting gage for the tool is brought into use as shown by the sketch, Fig. 3. In Fig. 2 this gage will be noticed lying on the floor in front of the press frame.

Referring to Fig. 3, it will be noticed that this gage is in the form of a plate which is dropped on the work and drawn up snugly against the finished edge, while upon the top near the opposite end there is a projecting ledge which forms a setting point for the outside of the squaring down tool. This setting ledge gives the exact position for the tool to finish the opening to the required width to receive the ram slides.

A gage is seen at *A*, Figs. 1 and 2, which tests the accuracy of the planing and which also provides two setting points for the planer tools when squaring down the outside of the bearing bosses; these projecting gaging points are represented at *B B*.

Leaning against the press frame in Fig. 1, are two thin templets which, in Fig. 2, are represented as applied to the work for testing the distance between bearings and also the length of each bearing.

A Testing Square

Fig. 2 illustrates still another interesting feature. This is a special form of square for testing the accuracy of the bed in relation to the ram-slide seat. As will be noticed, the device has a cylindrical body at the end of which is placed a thin-steel blade projecting equal distances from the center, thus forming a T. In testing the work, tissue paper is applied under each end of the square blade, the square is rotated after being used in the position illustrated, to bring the blade in the horizontal plane, thus testing the squareness of the bed plate in both directions.

Planing Press Rams

A string planing operation is represented in Fig. 4 which has some unusual features. This operation consists in planing the angular bearing surfaces at each side of the press rams. For this work the planer head is set at the required angle and never shifted until the job is completed. That is, a taper dowel pin locks the swivel on the head in a definite position and the cuts over the four bevel edges are all made with the planer head traveling in one direction.

Fig. 5 is a section through one of these rams. In planing, a tool is placed in the holder and the cut taken on the underside of the work along surface *a;* after this beveled edge is finished a tool like that shown in position in Fig. 4 is used to plane face *b*, Fig. 5, this surface *b* being parallel with the opposite edge *a*. The whole fixture with the work is now turned end for end on the planer table and the head operated as before, to plane surfaces *c* and *d*. This method gives uniform angles on the work and produces accurate bearing surfaces.

The fixture is provided with suitable

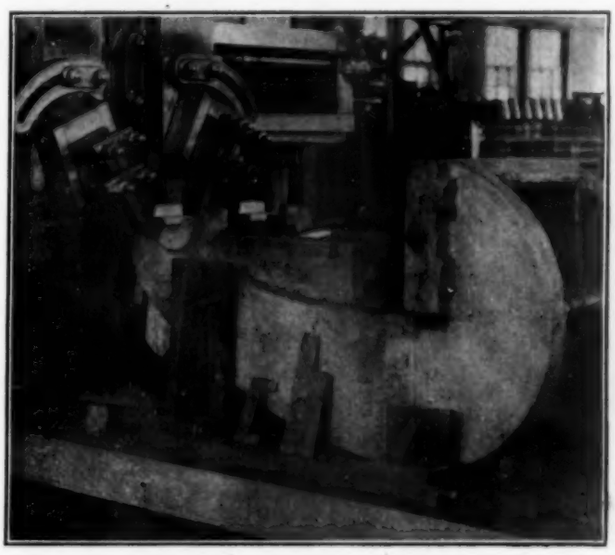


Fig. 1. Planing the Press Frame

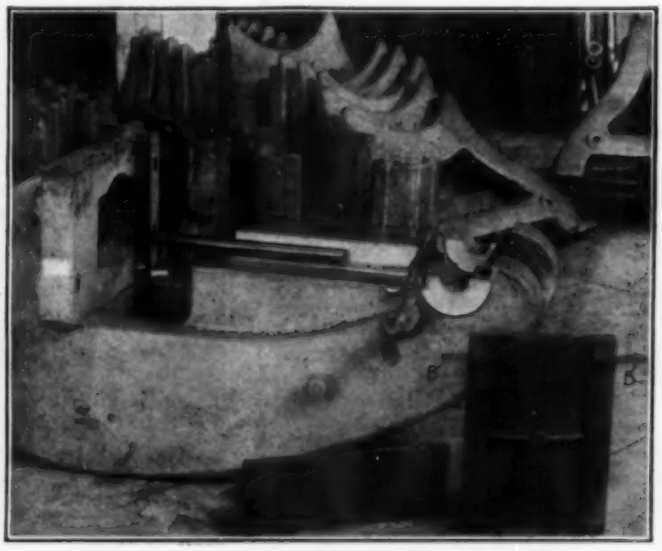


Fig. 2. A Testing Square on the Press Frame

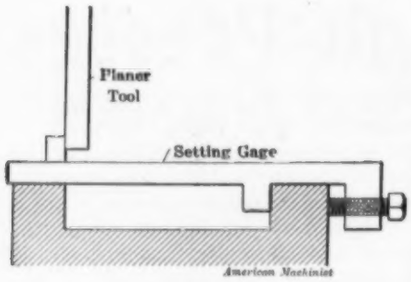


FIG. 3. A SETTING GAGE FOR THE PLANER TOOL

BORING ON THE MILLING MACHINE

The milling machine in Fig. 7 is shown equipped with a fixture for holding the press ram while the lower face is milled off square and the hole bored for the punch shank. As will be seen, the rams have been fitted with the steel caps for holding the punch prior to coming to this machine for the boring and milling operation. The cutter for squaring the end of the ram is a large inserted-tooth face mill which screws upon the nose of the milling-machine spindle. This cutter will be seen resting upon the fixture. The boring cutter is carried in the end of an arbor which fits the taper hole in the mouth of the spindle.

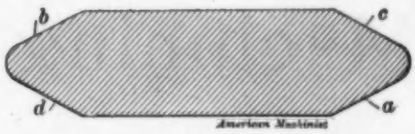


FIG. 5. SECTION THROUGH PRESS RAM

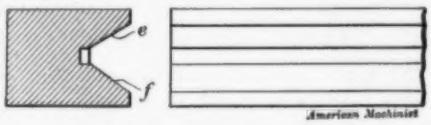


FIG. 6. SECTION OF SLIDE

FIG. 4. PLANING PUNCH-PRESS RAMS

supporting screws and stops for the castings and they are leveled with little difficulty on the fixture; the clamps which hold the work are shown clearly and it will be seen that they are provided with contact screws near each end which bear upon the work at points directly above the supporting screws under the castings.

ANOTHER STRING PLANING OPERATION

The ram slides, one of which is represented in the sketch, Fig. 6, are also planed, several at a time, in a long fixture. Before the angular bearing surfaces in the slides are machined the slides are milled down approximately to size and then planed to standard thickness. After this they are placed in a long planing fixture and with the head set as in Fig. 4, bearing surface *e*, Fig. 6, is planed, then the pieces are turned over, bringing surface *f* into the position formerly occupied by *e*, and *f* is then finished with the same setting of the planer head.

This process of planing ram and slide bearing surfaces makes them practically interchangeable.

The feed during the boring operation is necessarily rather light, as the cutter is working half in steel and half in the casting.

A ZIGZAG MILLING CUT

A peculiar milling performance is illustrated by Fig. 8, which shows the method devised for cutting zig-zag oil grooves in the bearing surfaces of the slides. To accomplish this satisfactorily a fixture was made having a cam slot as shown, corresponding to the path required for the oil groove, and a roll bracket adapted to control the fixture was arranged to be attached to the column of the miller. Upon examining Fig. 8 it will be obvious that with a roll fitting the slot in the fixture, when the table is traversed, the sliding portion of the fixture and the work which it carries at the top will move in and out, toward and away from the spindle in accordance with the course of the cam slot.

A shank mill with a narrow cutter of small diameter is used and it is found that the work can be fed very rapidly past the cutter, producing a clean, smooth groove. After the groove has been milled in the lower face the piece is turned over,

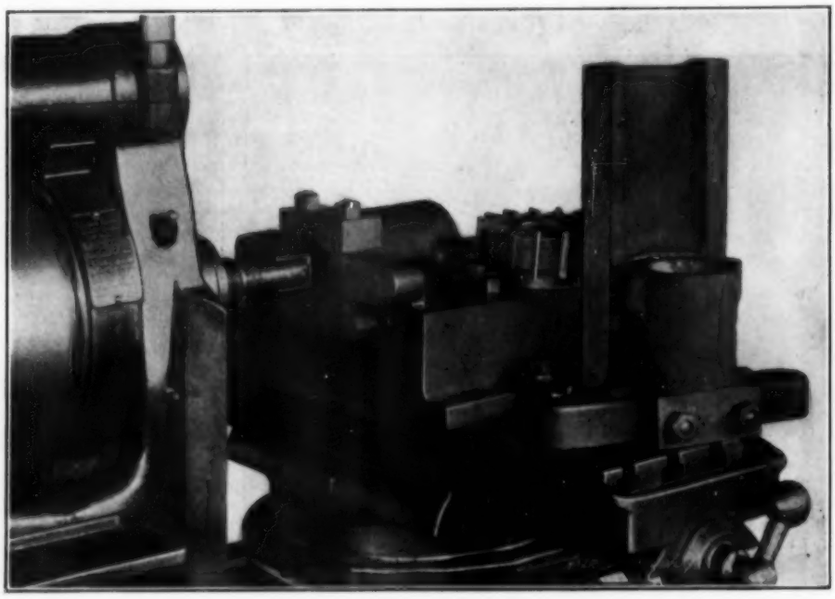


FIG. 7. FIXTURE FOR MILLING AND BORING PRESS RAMS

bringing the second bearing surface into the horizontal plane ready to have its oil groove cut.

Testing Press Parts

Figs. 9 and 10 show some methods of testing which should be of interest. The rams are tested to see if the lower end is square with the guiding surfaces by resting the ram upon the surface plate, Fig. 9, and bringing a large square against the bearing surface as shown. The square is applied at both sides and the end of the ram is scraped until it stands perfectly square under this test. A plate with a shank is shown to the right of the square, which is utilized in testing the hole to find if it is square with the bottom of the ram. The hub on this plate fits the hole for the punch shank and the device forms a surface plate by which any error due to boring the hole out of truth may be detected; in case this plate shows the hole to be "out" the hole must be scraped until perfectly square with the end of the ram.

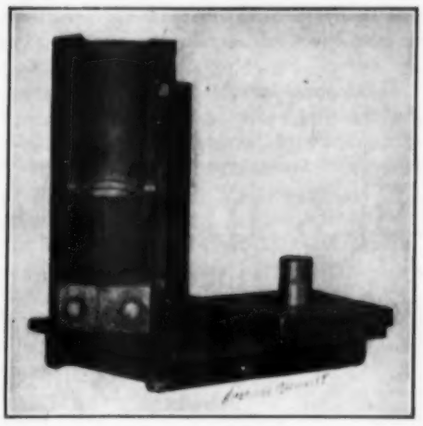


Fig. 9. The Press Ram on the Surface Plate

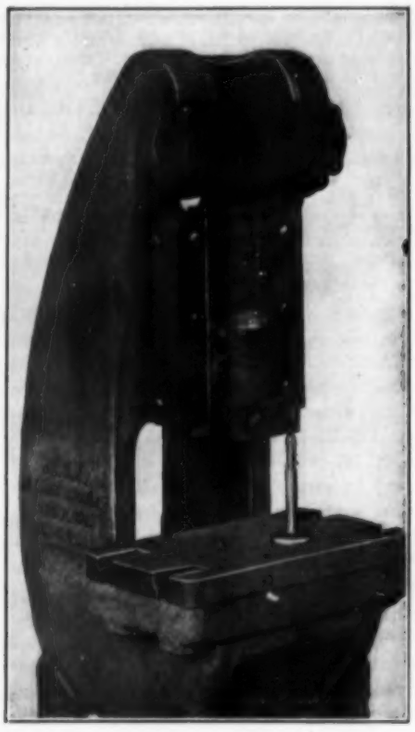


Fig. 10. Testing the Accuracy of Ram and Bolster with Micrometer Hight Gage

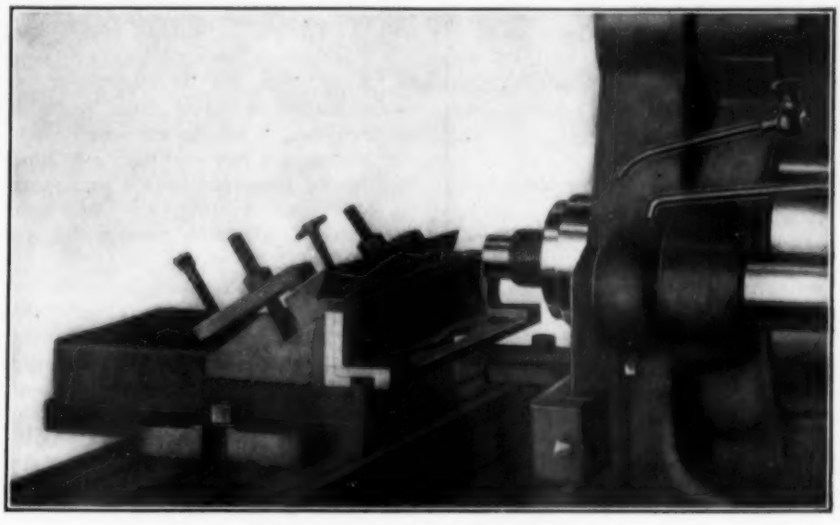


Fig. 8. Milling Oil Grooves

When the ram is placed in the press another test is applied as in Fig. 10, to determine if the ram is square with the bolster. Here a micrometer hight gage is used and the gage is passed under different points around the ram face. In this test the end of the ram must show parallel with the bolster within a limit of 0.001 inch.

Boxes and Crates for Machine Tools

By Robert Grimshaw

It is very frequently complained over here in Europe, that Americans do not box and crate their machinery properly. I received a planer here in Dresden, from an Ohio firm, in about twenty pieces. Another one from the same firm was so rusty that it cost about $19 to clean it. There is, however, a Cincinnati firm that understands its business in this particular; uses matched boards of good stout stuff, and gives all machinery a coat of lime and tallow, or of vaseline, on bright parts. They come to hand in good shape.

The fault lies principally in using too light stuff, and in not putting it in the right places. If the latter point does not receive attention, no amount of thickness will prevent the crates or boxes being deformed when tossed about in a ship's hold. To prevent this, the box maker, and more especially the crate maker, must take a lesson from the bridge builder and the house framer, that the triangle is the only geometrical shape that cannot be deformed without breaking or bending its members. A square composed of four pieces united at the angles by a single pin at right angles to the plane of the sides can be made into a rhombus, by simply altering the angle. But with a triangular frame no displacement or change of angle is possible without breaking or bending at least one side. Here we got the valuable principle of the diagonal brace, whether used as a tie or a strut, with due regard to the stresses.

If box and crate makers would take care to nail diagonal pieces from any corner to the opposite one of each side, or face, the strength would be much greater for the same weight of material used, or there would be needed less material for the same resistance to "cutting" and other stresses. With crates, a little help may be got by nailing on the intermediate slat or slats on each side, a trifle at an angle to the edge slats. With the same number and size of slats stiffness may thus be materially increased; all that is required is not to leave too much open space.

As a rule, box and crate makers fail to remember that the bottom of the package carries the most weight. The boards might well be a trifle heavier than those for the sides, but this will do little good unless there are more or stronger nails.

For soft-wood boxes and crates which have to be opened in the customs house, or which are taken back at a reduced price, if received in good condition, I recommend the use of long thin screws for the covers, driven in with the hammer. They may be drawn with the screw-driver, and there will be no damage done to the cover.

If shippers would instruct their box makers what sort of articles are to be sent, it would help all parties greatly. Some articles may be dropped in the box from the top, others are best slid in from the side; and once in a while it is advantageous to drop the box cover over the article, turn the whole affair upside down, and nail on the bottom.

Detail Drawings in Mass Production

By Alban Rice

It is difficult to overemphasize the value of proper detail drawings in mass production.

Examples of right and wrong dimensioning support this fact.

Many draftsmen look upon their work as merely a stepping stone to something else, and therefore do not take the pains to become as efficient as they might.

From time to time mistakes are made in the shop, due to misinterpretation of drawings. In some of these cases, where the trouble is caused by a poor method in dimensioning the drawings, the draftsmen are criticized, and very often justly. If the elementary principles of dimensioning are ignored, poor results must inevitably follow. In the more ordinary cases there is hardly any excuse for the draftsman, except the ignorance that goes with inexperience. Very often, however, the proper method of dimensioning will suggest itself only to the thoughtful draftsman with a long experience.

Again, when die, pattern or other tools are made to produce parts shown, questions are often asked by the shop; showing that drawings are not always as plain and comprehensible as could be wished. The man, making an expensive tool, naturally hesitates unless the drawing is absolutely clear to him. He must be certain, and if his questioning has to be kept up he loses confidence in drawings in general.

Difficulties that can readily be traced to the draftsman are also encountered when parts are being assembled; although apparently made to drawings, they do not fit together as expected. These troubles are obviously serious, and are mostly due to the failure of the draftsman in dimensioning his drawings, to judge properly the amount of mechanical clearance necessary between two parts of a certain fit, or between rough and finished parts, etc. Although 1/16 inch mechanical clearance between two rough parts looks as good on paper as the same clearance between finished parts, this clearance is, as a rule, more than eaten up by the reasonable commercial variations of the parts. There is a great difference between a forging and a die-cast part, but on paper one looks as clear and definite in outline as the other.

If the draftsman would spend more care and study in dimensioning drawings, and try to use more judgment and logic on the subject, a large percentage of these troubles would be eliminated. He must bear in mind that if the draftsman at times may get some credit for the general design, he will, and reasonably so, at all times get the discredit for whatever trouble is caused by poor judgment in dimensioning detail drawings as well as in detail design. No one but himself and the checker, who is also a draftsman, has a chance to go over the minute details of a set of drawings.

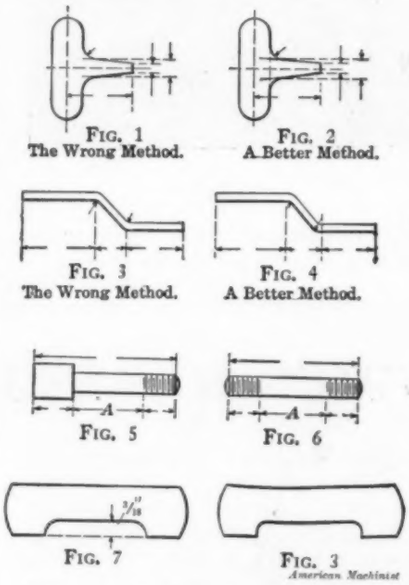


FIG. 1 The Wrong Method. FIG. 2 A Better Method. FIG. 3 The Wrong Method. FIG. 4 A Better Method. FIG. 5 FIG. 6 FIG. 7 FIG. 3 American Machinist

EXAMPLES OF DIMENSIONING DETAIL DRAWINGS

A draftsman may learn to draw the different views of details in a comparatively short time, but to learn to dimension such drawings properly takes a considerably longer time, due to the fact that it is generally taught in one way only, and that is through many experiences, and frequent intercourse with the shop. Dimensions and other information given on drawings are, of course, understood by everybody to be very important, but the method of dimensioning drawings is not as generally appreciated as it should be. In his praiseworthy efforts to acquire knowledge on different technical subjects, the young draftsman is apt to overlook such a little (?) thing as dimensioning, and as soon as he has learned to master the art of projection, he begins to clamor for better and better work, especially experimental work, which seems to be the goal of his ambition. He fails to appreciate the fine points in detail design, and this is not altogether his fault, as he gets his ideas from his surroundings. A young draftsman, about three years in the business, in asking the writer's advice regarding a book on "Gearing," that he intended to study, made a remark to the effect that gearing was the only thing he did not know much about, he knew all the rest.

The draftsman, as a rule, hears of troubles experienced in the shop, if he hears of them at all, through the medium of his foreman and, therefore, even though the man in charge does his best to bring home the points, they do not impress him as much as if he had heard directly the criticism and sarcasm of the engineer or shop man. From a draftsman's point of view, the dimensions on a particular drawing are correct, and they might be called correct if the drawing is read in its broad sense rather than with a literal interpretation.

The draftsman in the small shop does not need to trouble himself much with the method of dimensioning. As long as most of the dimensions are there, and they are in the main correct, he gets along very well. The shop foreman or foremen are naturally close by, and as a rule, they know how the different parts should go together, and make them accordingly, that is, they work to the broad sense of the drawing.

The larger a manufacturing concern is, the more important become the drawings. In a plant where the different parts of a machine are made in masses, in different departments, under foremen who have not time to familiarize themselves with how the thousand different parts made in their departments are finally assembled into the many different machines, or where parts in a great number of cases are ordered outside of the concern according to certain detail drawings, the value of drawings that can be read literally, or which in shop language are made "fool proof," cannot be overestimated.

Some Examples of Dimensioning

To show what is meant by "proper method of dimensioning," referred to above, I will illustrate the point by some of the cases that have come under my observation:

Figs. 1 and 2 represent a flat punching. Fig. 1 gives the outline of the lip in a rather uncertain manner, whereas Fig. 2 is absolutely certain in outline.

Figs. 3 and 4 represent the side views of a punching. It is a similar case to the one shown in Figs. 1 and 2.

Figs. 5 and 6 show two similar cases where dimensions are given that should be left out. Dimension *A* is absolutely useless.

Fig. 7 represents a punching. It is perfectly obvious to a draftsman that the radius in the corner should be 3/16 inch. It is not so clear to the die maker, as is shown in Fig. 8, which represents samples as received. The drawing in not actually specifying the radius was not complete.

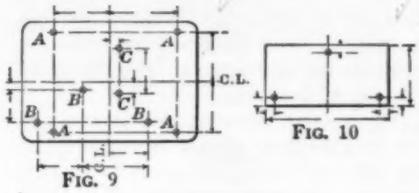


Fig. 9

Fig. 10

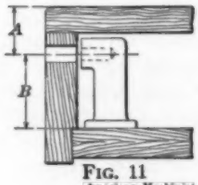


Fig. 11

Examples of Dimensioning Detail Drawings

Fig. 9 illustrates the proper method of dimensioning a plate or frame on which other parts are assembled. The location of the tapped or drilled holes should be given in sets, according to the parts assembled on the frame. In this case a certain part uses the holes *A*, another the holes *B*, etc. If the location of the holes are given at random, the drawing will be more confusing and troublesome to parties using it for reference and checking, besides it will bring poorer results in accuracy of parts.

Fig. 10 represents a wooden block. The holes shown are to be used for the screws holding it to another part. It is often seen dimensioned in the absurd way shown in the figure. It is obvious that dimensions between the holes should be given.

Fig. 11 represents a wooden box into which is assembled a casting. It is readily seen that in the detail of this box, dimension *B* only should be given, in order to line up holes in casting and box properly. If dimension *A* is given, the chance of getting the holes to line up is small, owing to the carpenter's well known disregard for anything smaller than 1/16 inch.

Figs. 12 and 13 represent a cast case. Practically everything in the machine rests on the finished surfaces of the lugs, including the parts that should line up with the drilled holes in the sides. The distance from the top of the case to the finished surfaces is, in this particular case, more important than the distance from the bottom. If dimensioned as in Fig. 12, it leaves a man hesitating where to work from, besides the chances of good results are less.

In Fig. 14 the hight of the bosses are given from the unfinished surfaces. As the distance between the finished surfaces generally is more important, the part should be dimensioned accordingly, otherwise this distance may be out enough to interfere with ease of assembling.

Fig. 16 shows a case similar to the one shown in Fig. 14. It should not surprise a draftsman if the parts were impossible to assemble.

Figs. 18, 19 and 20 represent a casting. If, as at Fig. 18, the depth of the counterbore is given, the distance *A*, in Fig. 19, will vary with thickness of the casting at bottom, and many nuts will not catch enough threads to hold the bushing.

Fig. 21 shows a case where the location of two holes should be given from the edges with no dimension between them. The ears are held in place by one screw only, and depend on the fit of the parts not to rock. Close limits for location must be given.

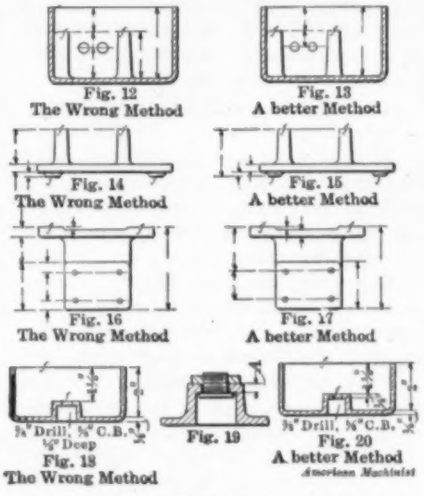
Fig. 22 shows a stud with a nurled head. The stud with head included was finished to diameter specified. In the process of nurling, the diameter of the head was slightly increased which for certain reasons was unacceptable. The thoughtful draftsman would have specified diameter of head after nurling.

In Fig. 23 the cast arm must be securely held on the shaft, which is made from 3/16-inch cold-rolled steel rod. This shaft will naturally vary in diameter. The casting must be driven on and pinned. In this case it is impossible to so dimension hole in detail drawing of casting that all the parts will drive. The best that can be done is to dimension the hole somewhat smaller, and call for parts to be fitted in assembling.

Fig. 24 represents a forged-steel magnet. It must be drilled and tapped for the supporting pillars before hardening. As the magnets in the hardening process spring somewhat out of shape, the pillars must be finished on top and tapped after assembling to magnet. The detail drawing of the pillar should omit the hole, and the length must be slightly increased to allow for finishing.

Detail Design

Frequently draftsmen complain that among engineers and others there exists a more or less silent disregard for draftsmen, and that drafting often is looked upon as "a necessary evil," etc. It can hardly be denied that this feeling really is there, and also that it is somewhat justified. Draftsmen, as a rule, do not look upon their occupation as a profession. A number of them have a complete engineering education, and naturally look upon the drafting room only as a stepping stone to something higher, generally the engineering department. This idea spreads to other draftsmen, and their best efforts are turned in that direction. They do not realize the part that they should rightly play in the shop organization. They fail to understand sufficiently the importance of detail design, and consequently their work very often shows a lack of good judgment in parts of the detail design over which the engineer has had no control. The majority of draftsmen could, if their efforts were concentrated on it, qualify for positions as real designers and work themselves into a



Examples of Dimensioning Detail Drawings

sphere that is far from crowded. On the other hand very few draftsmen have, or will acquire, the qualifications that are necessary to become successful engineers, and it must be admitted that the engineering profession is, comparatively speaking, somewhat crowded with men of ordinary ability. If these statements are true, it follows that draftsmen should have the best chance in their own department. This reasoning applies also to most draftsmen with engineering education. The title engineer or draftsman should not influence anyone's judgment.

As said above, a draftsman's ambition seems to be headed for experimental design and, of course, it naturally takes men with experience and some inventive ability to do this class of work. I do not want to minimize its importance to draftsmen, but when the model is built, and all is said, it simply represents the ideas of the engineer on the subject. In

the model it is the *general design*, the principle involved and the working ability that counts and, of course, the engineer, with rare exceptions, justly gets the credit. The detail design of a model is more or less unimportant, and all the little faults and errors in it do not show up. The model maker will put together almost any foolishly designed details and make the model look right, and nobody will know the difference.

Supposing, however, that it was decided to build apparatus on the plan of the model at a rate of a few hundred a week. The work of making drawings for such production is usually given to a draftsman *less advanced* than the man who made the sketches for the model, but the question is, should not this important work on the contrary belong to a man *further advanced*? Many draftsmen silently and sometimes openly resent the idea of being chosen for this class of work, it looks to them just like copying. Apparently nobody thinks anything of it, and draftsmen do not seem to understand that this is their proper field, here is where they have the best chance to show their experience in designing and their knowledge of shop methods, here is where full credit will be given them if their work is well done. Plenty of time to do this work will be allowed when draftsmen can show good cause for it. If these drawings are made by simply copying the sketches used for the model, with the necessary elaboration for production work, and scant thought be given to factory conditions, etc., chances are that we will be in constant hot water during the early stages of production.

When tool-making begins, a lot of minor changes are asked for to facilitate matters. In making the first lot of parts, the foremen in the detail departments will ask for changes to reduce cost, etc. In the preliminary assembling a lot of minor points come up which will require changes, similarly in the final assembling. In these later stages changes become more serious, as they affect tools and tend to create a chaos in production, which often mean very annoying delays. A number of these troubles are rather difficult to foresee, and a certain amount of them cannot be avoided, but one thing is certain, the more practical and the more experienced the draftsman is who is making or looking after the making of detail drawings, the better the results in production.

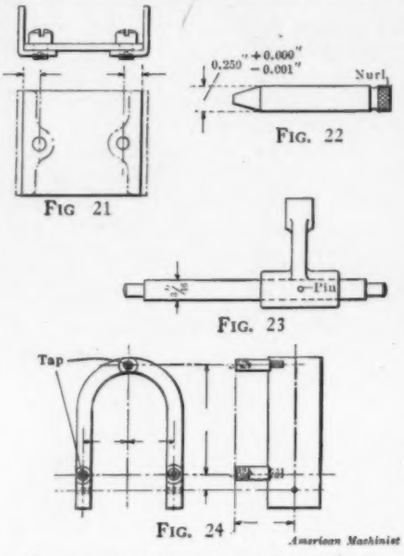


FIG 21 FIG. 22 FIG. 23 FIG. 24

EXAMPLES OF DIMENSIONING DETAIL DRAWINGS

The original model may be O. K. in the general design, but it is often far from finished in its details, and it is almost impossible to overrate the importance of detail design in mass-production of apparatus. To do this work properly a draftsman must have a long experience and a good deal of it must be on that particular class of apparatus. There are many factors to be taken into consideration; the nature of the parts, the material used, factory conditions, transportation and handling of parts, cost of production, the use of standard parts, ease of assembling, interchangeability, etc. A good knowledge of different kinds of material must be displayed. The draftsman must also take into consideration the very important fact that in mass-production parts will not always come according to drawings, far from it sometimes. This trouble the draftsman must provide for, and so dimension and design his details that all possible and reasonable variations in all kinds of products will be taken care of, so that variations from actual drawing dimensions will not be noticed by the assembler.

Few draftsmen have any shop experience worthy of the name. It would take too many years to acquire it in a direct way. We cannot learn everything and that is the reason draftsmen with first-class shop experience are exceptions. Nevertheless, shop experience or what is a fair substitute for it, close connection between the shop and the drafting room, is absolutely necessary in order to modify properly the draftsman's viewpoint in the making of drawings.

When detail drawings are under way, the shop foremen should be consulted on the different parts that are to be made in their respective departments. The advice of these men, experts in their different lines, is naturally very valuable, and the draftsman should not try to get along without it. If every point the least doubtful is carefully studied in this manner, the practical knowledge of the draftsman will in a short time increase in a considerable degree.

The draftsman who devotes his main efforts in studying shop methods, and who learns the art of designing details and assembling them in a mechanical manner, will become a factor in the shop organization.

Student Work in a Trade School

By E. H. Fish *

In our desire to find suitable work for our boys at the Worcester Trade School we have built a considerable amount of equipment, notably in fitting up the drawing room. One of the resulting units is shown in Fig. 2. The drawing stand will be recognized at a glance as that built by the Washburn shops of our neighbor, the Polytechnic Institute. We bought the castings and fitted up the stands.

The stools were made entirely of cold-rolled rod and strip steel with a wooden top. The angle iron under the seat and the foot rest were made by bending a ring of strip steel, brazing it together and hammering it to shape over a former. The legs are secured to the angles by sheet-metal clips and a rivet through the leg to keep it from turning. The stools are light, make little or no noise when moved around and are practically unbreakable.

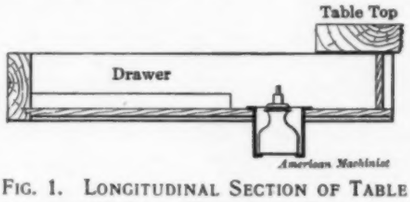


FIG. 1. LONGITUDINAL SECTION OF TABLE AND DRAWER. WORCESTER TRADE SCHOOL

The table is rather of an innovation. I have always felt the need of something of the kind, something that could be moved around so that the drawing from which one was working would be close at hand. The result is a table 22x26 inches, with a single small drawer large enough to hold only the individual kit of the student. This consists of the usual set of drawing instruments, triangular scale, triangles, irregular curve, protractor and ink.

The ink bottles are in the back of the drawer as shown in Fig. 1, in cross-section. The wells in which the bottles are set are made by taking 1⅞-inch tubing No. 18 gage and turning the bottom in enough so that the bottle cannot fall through and turning the top out so that it will not fall through the hole in the

*Manager of Worcester Trade School.

bottom of the drawer, both being done by hammering over a form. This is as simply effective a way of keeping ink from being spilled on the drawings as I can imagine.

Each drawer has a series of notches cut so that triangles, etc., can be set up on edge so as to be convenient to the hand. All the other equipment of the drawing room, including the boards, tee squares, storage racks for drawing boards, and a movable blackboard which slides up and down are likewise of student manufacture.

A Stock Rack

In the basement we have a rack which is both a steel rack and a rack for steel. It is made up, as the halftone indicates, out of angles riveted together. The overhanging arms on each side are for long bars which can be taken out either endwise or sidewise as necessary. The space between the uprights is lined with sheet steel, making a trough in which short pieces are kept. The ends of the overhanging arms were cut out as shown and bent up by hand to make a stop to keep the stock from rolling off.

This rack was begun when our first boys had had only about a month's shop experience. Taken as a whole it would have been an impossible proposition, but by dividing it into a series of operations it became as simple as the same number of class-room problems and infinitely more profitable to the boys. The cutting off of the stock to the lengths given on the drawing was one operation. The dividing up of the hight into equal divisions and the marking for the rivet holes another, the drilling another, then the laying out of the crossarms, cutting out the web where the ends are turned up another and so on, each step being simple and the whole a pretty complex job for a beginner. The building of it was very conveniently carried out with our equipment and was interesting.

Fig. 2. Student Work in the Worcester Trade School

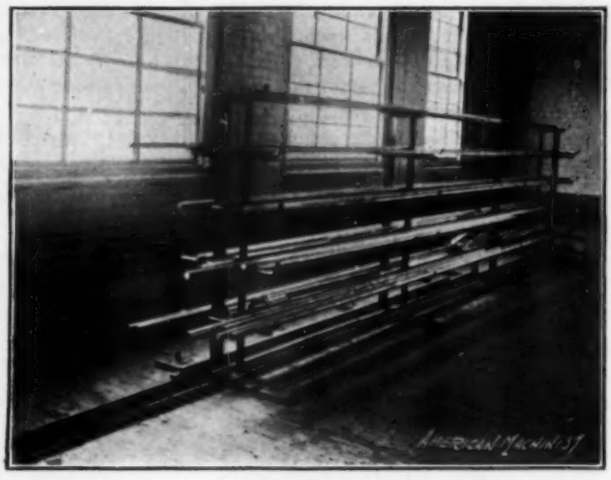
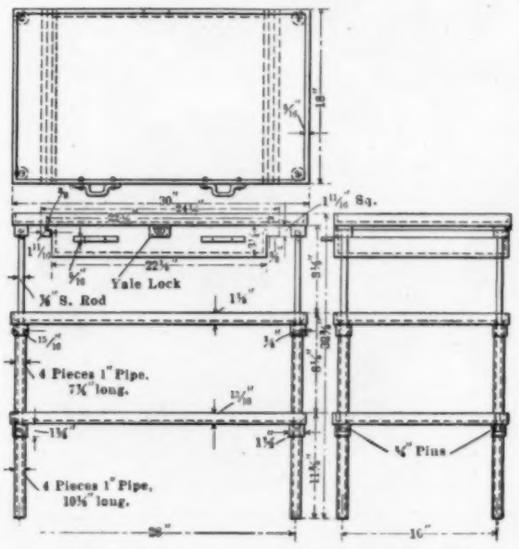


Fig. 3.

A Handy Machine Shop Stand

Editorial Correspondence

Many of the shops of the New York Central line are equipped with tool stands similar to those shown in the accompanying illustration. The shelves are cast iron with a raised edge, and the legs are of one-inch pipe as indicated. Through these runs a ⅞-inch rod to which the pieces of pipe are fastened by set screws in the collars which support the shelves, the set screws going through both the collar and the pipe to the rod in the center. A drawer is provided under the top shelf. The shelves are 18x30 inches outside measurement, the edge of the top being 32⅜ inches from the floor.



Machine-tool Stand

American Machinist

A rather amusing report of an automatic poker-playing machine, patent application for which has recently been filed at Washington, written up in true newspaper style, is herewith quoted from: It deals the cards, skins them over to see what you've got, discards for you and draws to your hand. Then it throws the bad hand in the discards and shuffles for a new deal—and all by pressing a button—an electric button, of course. The machine consists of a drum-like cylinder about six inches long and the same in diameter. On this are set five rows of cards, each row encircling the cylinder like a band. Each row contains thirteen cards. The total number of cards thus comprising fifty-two are marked as to suits so that there is a full quota of each. The cards thus make up an ordinary pack.

Heat Treating High Speed Tools—II

By C. P. Berg *

The alterations in the grain structure of high-speed steels as shown by actual size photographs and photomicrographs. A study of this change of grain and its effect on the durability of cutting tools; also on the cracking and burning of tools by too high temperatures or heating too suddenly.

*Production engineer, Link-Belt Company.

In order to get a good comparison of the effect of the various temperatures upon the high-speed steel tools, two sets of photographs were made. First, the specimens were broken and a full-sized photograph made of the fracture, so a comparison could readily be made with fractures of broken tools in the shop. Then the specimens were polished, etched and photomicrographs made, to show the variation in the structure of the steel that was caused by the temperature.

The full-size halftones of fractures from the specimens in this series in the upper part of Fig. 11, also clearly indicate the increasing size of grain with the increased quenching temperature of the specimen.

FRACTURES FROM SERIES B.

Examining the illustrations of the specimens from series B, as shown in the lower parts of Figs. 11 and 12, it will be seen that the grain of the steel increases gradually up to specimen No. 16, and afterward very rapidly, showing that the steel is very sensitive to heat treatment above the temperature at which this specimen was treated.

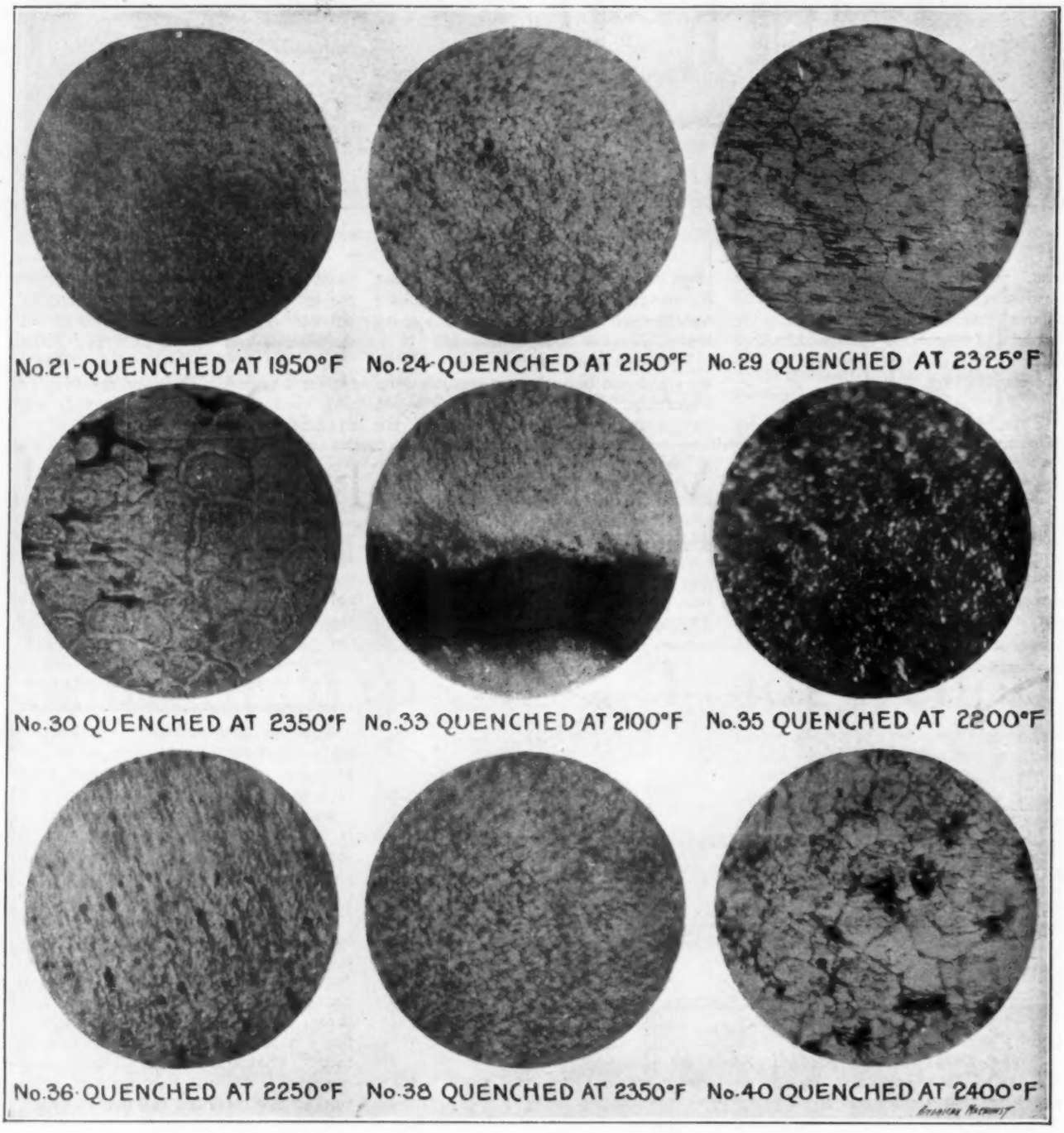


FIG. 10. SERIES C AND D SPECIMENS, MAGNIFICATION 300 DIAMETERS

For the same reason that specimen No. 7 was chosen as the best of series A, specimen No. 16 is selected from this group. The physical defects which appear in the specimens preceding and following specimen No. 16 are entirely absent here.

Comparing this result with the results of the physical tests shown in the diagram in Fig. 6, it appears that the two do not agree for this steel. The diagram shows that the maximum durability of the steels in series B is attained by specimen No. 19. This occurrence can hardly be accounted for unless it is due to a minimum of separated hard constitutents around the steel crystals, even at the higher temperatures.

The full-size illustrations of the fractures, as shown in the lower part of Fig. 10, show the increasing size of grain with the increased quenching temperature like the steel in series A.

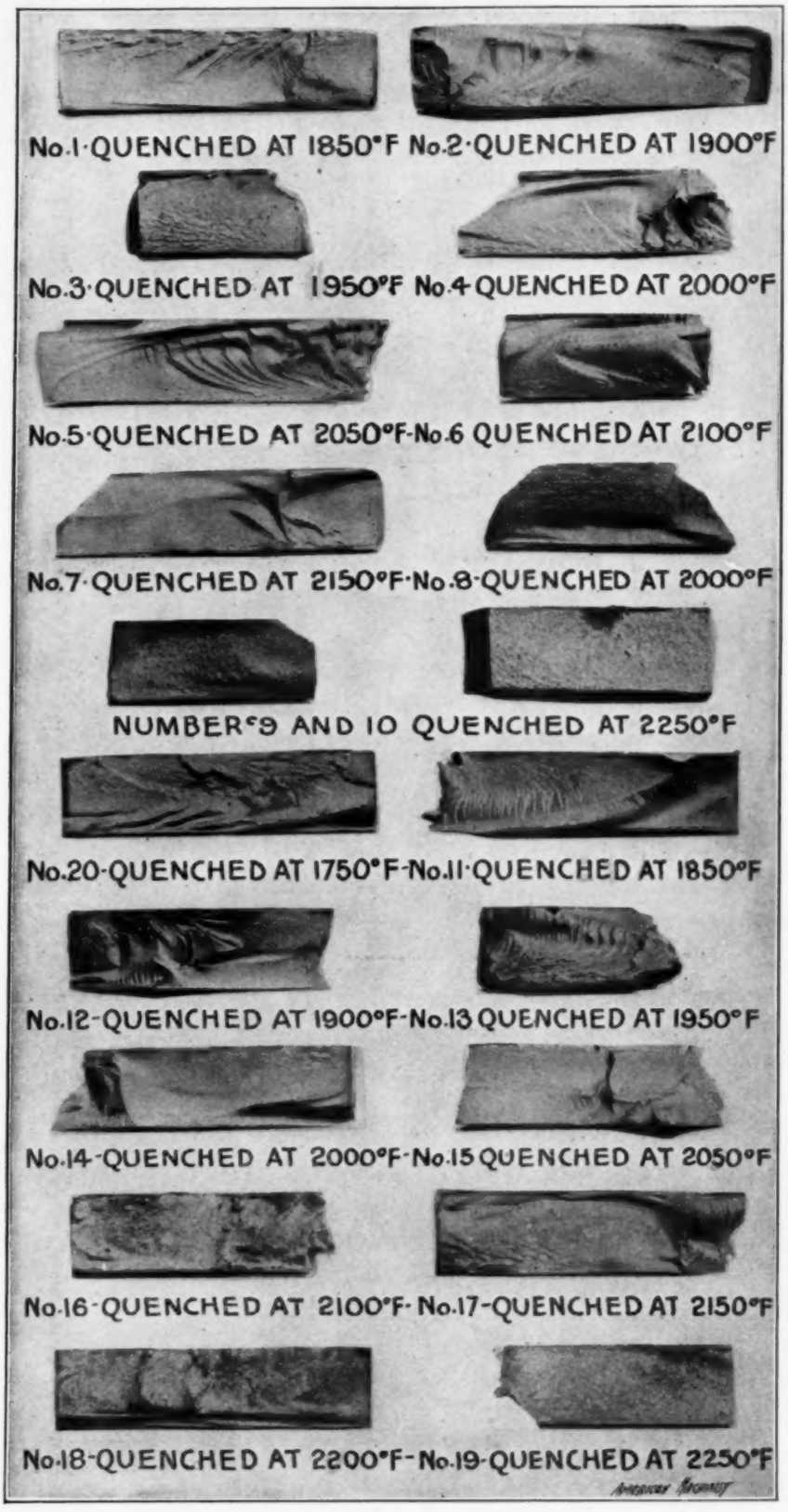


FIG. 11. FRACTURES OF SERIES A AND B SPECIMENS

FEATURES OF SERIES C

The illustrations of the specimens of series C, as shown in the upper parts of Figs. 10 and 13, show that the size of crystal grains in this group increases gradually up to the point where the steel becomes burned, as shown in specimen No. 30.

For this series No. 24 is chosen as the best specimen, because of its clean structure, the absence of any separation of the constitutents, and the uniform size of the crystal grains.

In specimen No. 30 the steel shows the same effects of burning as specimen No. 0 of series A; the separation of hard constitutents around the crystals and the black decarburized spots.

Also in this series the full-size illustrations of fractures show the increase in size of grain with the increased temperature.

FRACTURES OF SERIES D

The illustration of the specimens of series D, as shown in the lower parts of Figs. 10 and 13, show a very uniform structure up to specimens No. 38 and No. 40.

Specimen No. 40 shows distinctly marks of being burned, by the black decarburized spots; but the hard constituents surrounding the crystals, which are found in other burned specimens, are entirely absent here.

Specimen No. 38 shows a distinct difference from the ones just preceding and following, indicating that this steel has a narrow range of temperature in which it can be heated for the best results. This shows the clearest structure and is microscopically the best specimen of the group.

In the reproduction of one of the photographs from specimen No. 33, is shown a case referred to previously. It illustrates how one tool cracked that had been heated too rapidly and quenched before the heat had been allowed to uniformly penetrate to its center. However, it appears remarkable that this specimen did not break under the physical test.

The full-size illustrations of the fractures show the increase in size of grain as in the preceding series.

EFFECT OF STRUCTURE UPON THE RED HARDNESS

The property named red hardness in a

high-speed tool steel, that enables it to cut metal when the cutting edge and near portions are heated to a dull red, should, to a certain extent, be related to the structure of the steel, according to the above statements.

present at some temperatures. As the structure of the steel, in this case, generally consists of crystals of an uneven size, the smaller ones of these are ground to pieces in a comparatively short time, and the cutting edge of the tool is ruined.

and apart from the various effects of the chip upon the tool when cutting metals.

To find the element, or combination of elements, in the steel, that is, responsible for the highest durability, requires

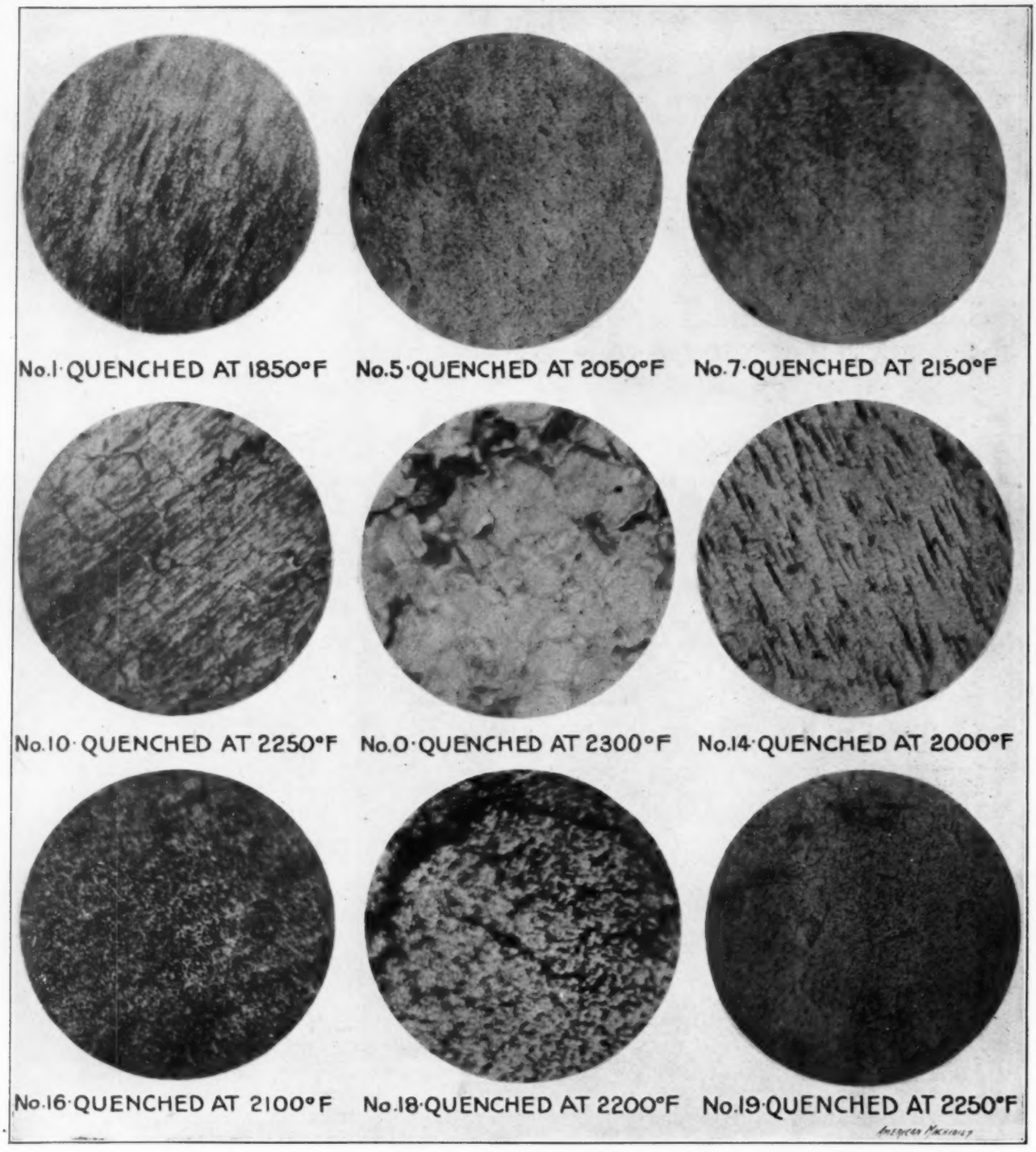

No.1 QUENCHED AT 1850°F
No.5 QUENCHED AT 2050°F
No.7 QUENCHED AT 2150°F
No.10 QUENCHED AT 2250°F
No.0 QUENCHED AT 2300°F
No.14 QUENCHED AT 2000°F
No.16 QUENCHED AT 2100°F
No.18 QUENCHED AT 2200°F
No.19 QUENCHED AT 2250°F

FIG. 12. SERIES A AND B SPECIMENS, MAGNIFICATION 300 DIAMETERS

The heat generated by friction between steel crystals in a body caused to move by vibration, does not destroy the tool as rapidly as the grinding on the crystals by the separated hard constituents that are

Therefore, a uniform size of crystals, without separated hard constituents between them, will give a large amount of red hardness or high durability; considering the structure of the steel only

the most elaborate experimenting, in the making of the steel, the heat treatments, and the physical tests, and is beyond the object of these experiments. However, it is seen that the two slightly different

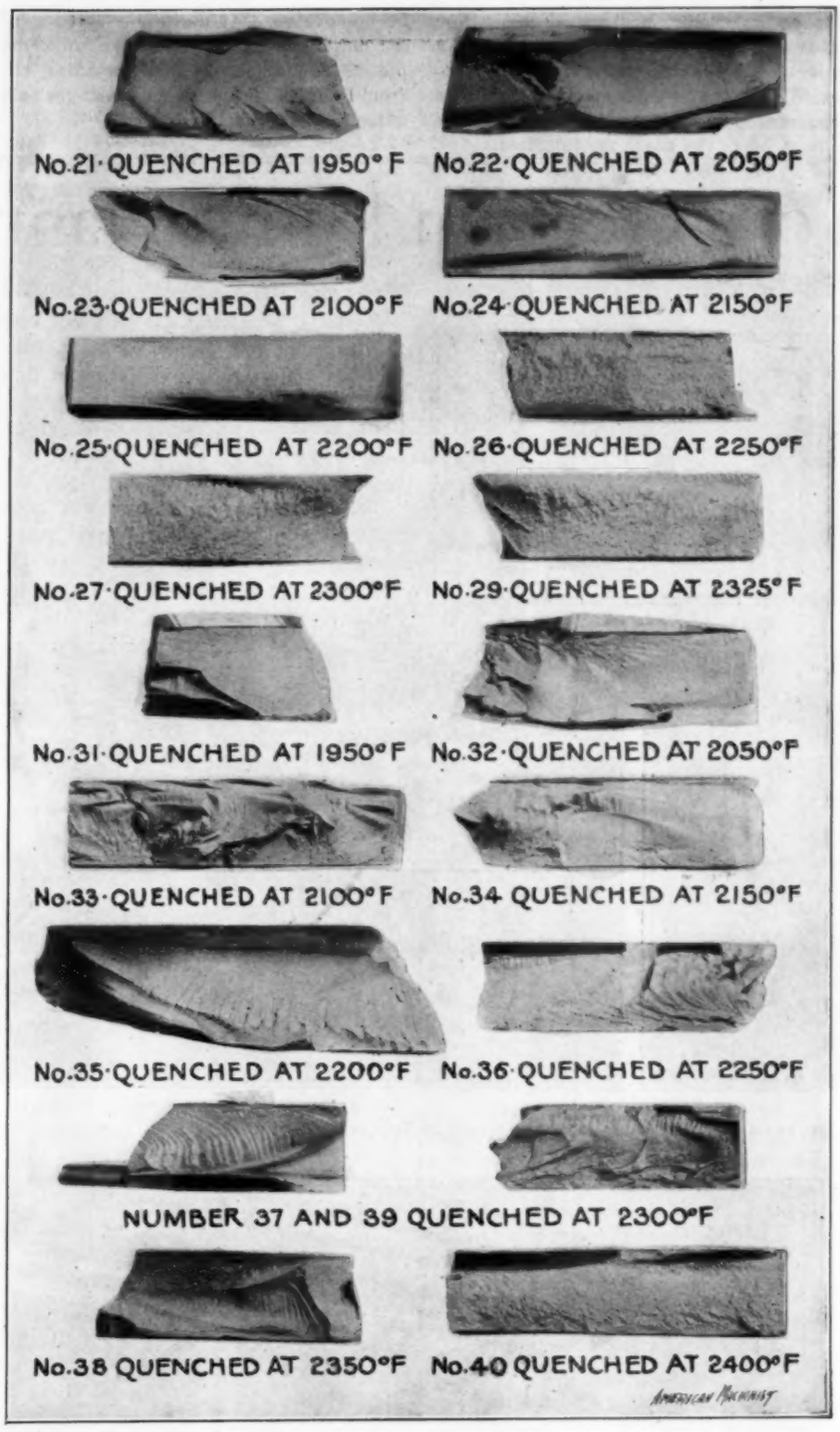


FIG. 13. FRACTURES OF SERIES C AND D SPECIMENS

chemical compositions of steel, subject to the same heat treatment, show a great difference in durability.

Taking the results of these experiments as a whole, the general shop rule for treating a high-speed tool, "Heat it to a white heat and quench it"—has its shortcomings, because a variation of 50 degrees Fahrenheit cannot be determined by the eye.

The results of poorly treated tools are: A decrease in shop production for the manufacturer, who allows it inside his establishment.

An increase in the bill of the customer who pays for the tool and the work spent upon it. In short, it is a waste of energy and waste of capital.

The fact that proper heat-treating methods are easily attained makes this waste of energy and capital all the more inexcusable, and it is to be hoped that this article may serve to call attention to some of the more important points.

Development of a File Cutting Machine

BY C. H. PEABODY*

It is a tradition that the fine machine-cut files were failures, because they were too good, that is, too regular, and that it was necessary to impart to the file-cutting machine something of the irregularity that was found in hand-cut files. Now it appears that files cut better by hand than when machine driven. Since the file is essentially a hand tool, it is necessary to explain that it has been found advisable to substitute the regularity of a machine-driven file for testing quality, in place of just giving the file to workmen and asking them how they liked them.

It appears that a file maker, E. G. Herbert, of Manchester, England, originated the idea of a file-testing machine, his idea being very direct and practical. The file was held vertically and given a regular reciprocation by a machine; during the forward stroke an inch-square bar was pressed against one side by a 30-pound weight; on the return stroke the bar was drawn back out of the way. The file was given a stroke of six inches, and an automatic record was made of the number of strokes and the length of rod filed away. It is interesting to note that 40,000 strokes cut away from six to eight inches under favorable conditions.

There were, however, two anomalous conditions that were likely to occur when a file was tested in the machine: (a) A file would cut away regularly for a large number of strokes, it might be 20,000, 40,000 or 80,000 and then it would stop cutting suddenly. (*b*) The number of strokes that one side of the file would cut might be only half as many (or in extreme cases one-tenth as many) as the other side could make.

Examination showed that the sudden failure in any case was due to a glazing of the surface of the rod filed. In this condition the investigation was turned over to Professor Ripper, who changed the machine by giving the file a slight vertical rocking motion so that while the cutting surface remained in a vertical plane, the angle of the teeth was slightly varied, as is the case in hand filing. Immediately the anomalies disappeared, all the files of a given make and quality giving substantially the same service, the difference being not more than 10 per cent. from the averages, and both sides of a given file gave about the same service. A high grade of file would cut 10 or 12 inches of a steel bar, having 0.89 per cent. carbon, 0.30 per cent. manganese, 0.10 per cent. silicon and traces of phosphorus and sulphur.

It appeared that the maker tried to

*Professor of naval engineering, Massachusetts Institute of Technology.

play a trick on the professor by mixing high-grades files and inferior files in the same lot; but the machine immediately differentiated, for some of them cut 12 inches of the bar and others cut only 8 inches in 40,000 strokes. Examination of the teeth of the files by aid of a microscope enabled the professor to separate the two grades readily after he had reason to think they existed. It will be noted also, that the slight shifting of the cutting angle increased the work the file could do, as the new machine cut from half again to twice what the old machine was able to do.

Organization of a German Pump Plant

By F. zur Nedden

A specialized German machine shop, organized on these principles: Thorough standardization of types and parts; absolute interchangeability of all parts; a strong staff and competent officials, and getting a volume of work to keep the production departments constantly busy.

The firm of Weise & Monski, Halle, Germany, one of the most important firms building centrifugal pumps, has carried to a great degree the modern refinements of repetition manufacture. The decision to place their turbine-pump manufacture on this uptodate basis was made in the face of considerable difficulty. For it was not only necessary that branch offices throughout Europe and representatives throughout the world should send in a sufficient volume of orders, but centrifugal pumps require more accurate workmanship than the usual piston pumps.

Drafting room and shop united to develop a system of quantity manufacture and there grew up a form of organization which is well fitted to arouse general interest.

Principles of the Factory Organization

Under this organization the machine shops no longer deliver directly to the erecting shops, but deliver their output to an intermediate storehouse, which orders the parts in quantities, while it supplies these parts to the erecting shops single or in small numbers according to the latter's immediate needs. Beside plentiful general orders obtained through outside branches, and beside the necessary capital for maintaining a sufficiently large stock in the intermediate storehouse, the most important internal working conditions for such a plan of manufacture are as follows:

Thorough standardization of types and parts,

Absolute interchangeability of all parts,

A strong staff and competent officials.

A special organization which will keep the machine shop constantly busy, fully utilizing all machines, at the same time keeping up in the storehouse a supply of parts sufficient for the erecting shops, thereby producing in the storehouse a perfect equilibrium.

The accompanying illustrations show the working details of the general organization.

Figs. 1 and 2 are views in the turning shop with its grouped grinding machines, Fig. 1, and turret lathes, Fig. 2. Among other tools are high-speed lathes and au-

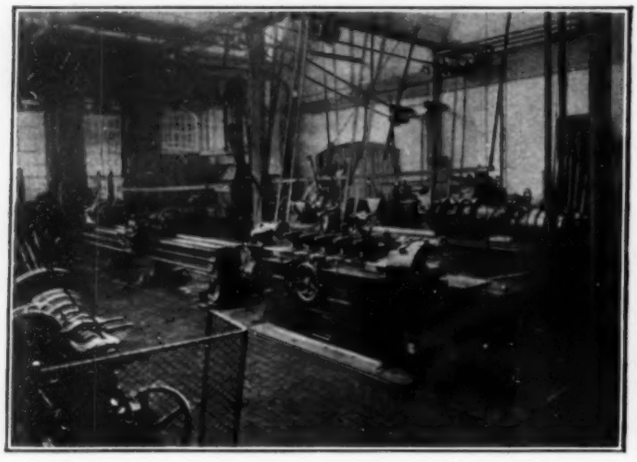


Fig. 1. Turning Department, Showing Arrangement of Tools

Fig. 2.

Fig. 3. Part of Drilling Department, Showing a Special Drilling Fixture

tomatic machines, whose suitability for modern manufacture is obvious.

Noteworthy is the drill department, Fig. 3, for its tools, their systematic arrangement and provisions for handling the work expeditiously. It is natural that jigs and fixtures are much used here. On the platen of the nearest radial drill is a fixture for alternate drilling of two simultaneously chucked pieces in a horizontal, or any oblique position.

In the drilling room, as well as the departments for heavy planers and large horizontal boring mills, individual electric motors are used, while economic considerations have led to the employment of group driving for most of the lathes and smaller tools. This plan is favored especially because of the simultaneous operation of all machines, and by a careful selection and maintenance of all transmission appliances.

Inspecting Rooms

In the middle of the turning shop is a carefully managed inspection room, Figs. 4 and 5. The pieces of work, as well as the measuring tools given out to the machinists, are here subjected to a constant, systematic inspection by two mutually independent inspectors. The tolerance for the limit gages, calipers and spherical-end gages used for all fits amounts, according to the absolute magnitude of their dimensions, to from 0.007 to 0.015 of a millimeter (0.0003 to 0.0006 inch). Wear or distortion of the gages is determined by a master set not given out to the workmen. The latter, in turn, are verified by higher officials in a special inspecting room with every provision against the influences of radiation and temperature, on a Hommel measuring machine, Fig. 6. On this machine scales and gages of length up to 1200 millimeters (48 inches) can be measured with a precision of 0.001 to 0.003 of a millimeter (0.00004 to 0.00012 inch).

Of interest is an auxiliary machine of special construction and manufacture, which allows quick and accurate comparison between the lengths of working and master gages. It is visible in the foreground of Fig. 7. The gages are successively laid on the same bed and pressed with equal force between two head plates, their difference being indicated by a Hirth minimeter in hundreths of a millimeter.

This great accuracy is necessary if interchangeability is to be guaranteed between pieces constructed years apart. These refinements become economically possible by using the gaging appliances to do custom work for other firms.

The tools of the machine shop are sharpened and kept in order in a toolroom, Fig. 8, near the inspecting room.

FIG. 4. INSPECTION ROOMS

FIG. 5.

Store Rooms and Erecting Shop

In the storehouse, Figs. 9 and 10, between the machine and erecting shops, is a card system, which requires the attention of only a single clerk, and which at any moment shows precisely what parts are on hand and what are required.

The erecting shops also are subdivided. Fig. 11 shows the department for large horizontal pumps. There is another for sinking pumps and one for small work, illustrated in Fig. 12. Such division permits an advantageous arrangement and use of the hoisting and other special appliances. Within the several departments the erection of high- and low-pressure pumps is given to different workmen. Thus the men attain special skill which results in quick work and low piece rates with high wages per hour.

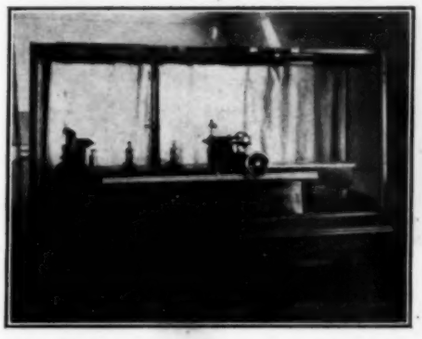


FIG. 6. HOMMEL MEASURING MACHINE

FIG. 7. MACHINE FOR COMPARING GAGES

FIG. 8. TOOL-SHARPENING ROOM AND OFFICE

In the sinking-pump department is an interesting and novel shaft for erecting these pumps in their working position. Fig. 13 shows one of four double pumps

FIG. 9. THE GENERAL STORE ROOM

FIG. 10.

shipped to England after being completely set up in this shaft.

BALANCING DEVICES

It is well known with what care the builder of high-speed machinery must adjust the rotating parts for static balance individually, and also for running balance at a variety of speeds when assembled. The devices built for this purpose by Weise & Monski are shown in Figs. 14 and 15. They are mounted on a cement foundation, separated from the rest of the masonry of the building so that vibrations and deflections from the horizontal may be avoided. The balancing spindles for the static fixture, Fig. 14, are ground steel arbors rolling on ground rails of hardened steel. The running balance device, Fig. 15, is equipped with a Brown & Sharpe indicator for eccentricity, on which the vibrations are minutely read and may be recorded in diagrams.

THE TESTING FLOORS

The principle of manufacture in quantities, which is so thoroughly applied and is especially illustrated is finally worked out on the testing floor, Fig. 16, where each of the pumps, even the smallest, is individually subjected to a careful trial. Power for the purpose is derived from the city electric system, the current being used with a potential from 100 to 500 volts, and in any desired form. A row of switchboards, Fig. 17, permits simultaneous measurement of the currents in whole and in part. The instruments are calibrated periodically at the Imperial Physical Technical Laboratory. The testing floor has at its service two alternating-current direct-current converters, seven motors from one to 100 horsepower and five transformers.

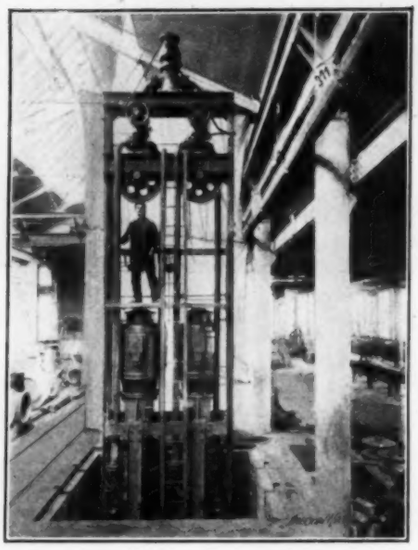


FIG. 13. ERECTING A SINKING PUMP IN A SHAFT IN THE SHOP

For measurement of the turning moments of the pump shaft an Amsler torsion dynamometer is used, shown set up for use in Fig. 18. Its errors are less than one per cent. There is also a precision instrument for measuring very small powers.

The water is measured with various calibrated tanks of 125 to 20,000 liters capacity, and in very large quantities by weirs, which are standardized by the Dortmund Mining Association. There is furthermore a special water meter, also developed here, for taking accurate and instantaneous readings in an extensive series of tests.

The manometer and vacuum meter are tested, on a Schäffer & Budenberg apparatus, against standard instruments which in turn are given a periodic calibration.

The economic result of a testing floor using so many appliances is avoidance of later trouble with the pumps; it is also particularly useful to permit constant

FIG. 11. THE ERECTING SHOPS

FIG. 12.

FIG. 14. STATIC-BALANCING DEVICE

FIG. 15. RUNNING-BALANCE MACHINE

FIG. 16. A PART OF THE TESTING FLOOR

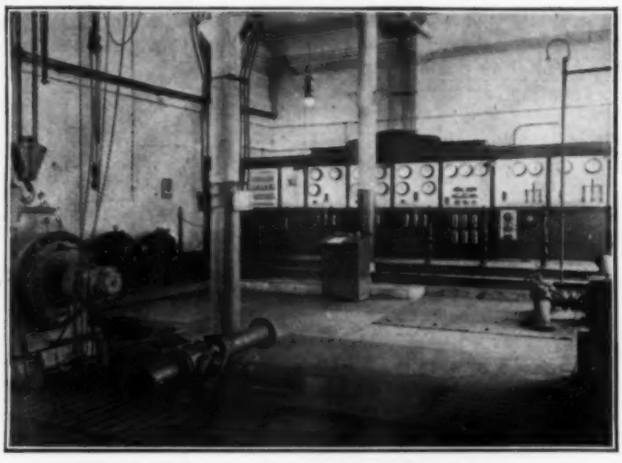


FIG. 17. SWITCHBOARD FOR TESTING FLOOR

FIG. 18. AMSLER TORSION DYNAMOMETER ON TESTING FLOOR

control over the quality of materials and manufacture, and—last but not least—to furnish the builders with accurate data for constant improvement of their output.

It is almost unnecessary to remark that in this pump factory of Weise & Monski the materials of construction also are subjected to thorough tests.

Aside from the direct economic advantages of the system described, it permits, in an almost automatic manner, of quick deliveries of pumps and interchangeable parts.

Removing Dirt from Hands and Washbasins

After a man has been doing a soldering job, it is often found almost impossible to remove the dirt from his hands with soap and water. There is something about tin, zinc, muriatic acid and resin which makes a coating almost insoluble in water. Ordinary soap has little effect upon it and a man can wash until he is tired and then be nearly as dirty as ever. A little gasolene applied with a rag and rubbed smartly over the hands will start the acid dirt almost like magic. It seems to come off almost before the gasolene touches the skin.

Gasolene may be poured upon the hands, which are then rubbed together as in the act of washing; then they may be wiped with a rag or bit of waste and most of the dirt will be gone. But a better way is to saturate a rag or some waste with gasolene, which is then applied to the hands and smartly rubbed over them. The metal dirt is removed by the rag and the hands are made clean much quicker than if gasolene be poured on and rubbed over the hands. After the gasolene dries, wash the hands thoroughly with soap and water.

The cub who has charge of the shop wash room is well aware of the time, trouble and Dutch cleanser necessary to get the black dirt off the white enameled sink, after twenty or thirty men have washed therein. Sometimes the boy will spend half an hour trying to get the dirt off, but a piece of waste wet with gasolene will start every vestige of dirt inside of a minute and a half.

The custom of washing the hands with soap and sand or sawdust should not be permitted in the shop washbasins as the sand and sawdust stop the drains very readily. Where sand and sawdust are used they should be thrown out in the open.

Letters from Practical Men

Concerning the details of making things in machine shops, from the first sketch to the shipping room.

A letter good enough to print is good enough to pay for. The value is in the idea—not the length of the letter.

Interesting Repair of a Coupling

In a large cotton mill the end of the main driving shaft was broken off close to a wall box, this end being coupled to the shafting in one of the rooms. The broken end was fast in a half of the coupling, and it was found impossible to knock it out so as to use the coupling over again. I decided, therefore, to make repairs in the following manner:

I had a strong clamping knee which I thought of using. In the wall I had three holes made for stone bolts below the projecting end of the broken shaft. The stone bolts were run in with sulphur and served for fastening the clamping knee to the wall. On the knee I screwed a lathe rest from the repair shop, and thus could turn the shaft for the coupling, as shown in Fig. 1. In the

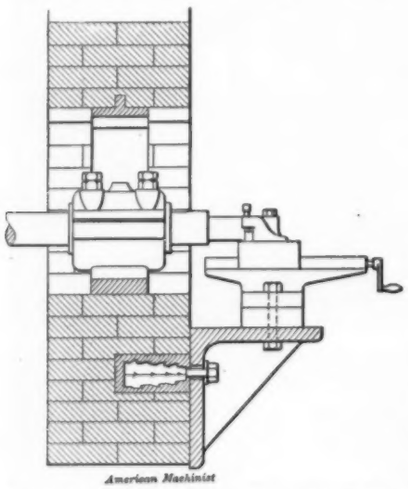


FIG. 1. ARRANGEMENT FOR TURNING DOWN THE FIT FOR THE COUPLING

meantime I wrapped the coupling with cotton soaked in petroleum, and incased this with a coat of loam, leaving two openings, *a* and *b*, Fig. 2. The cotton was ignited through hole *A*, and after burning it out, the coupling was loose in the cavity. At the same time the casing of loam was somewhat dried by the heat. Sand was then placed about the loam and melted lead was poured into it, filling the empty space. This suddenly heated the coupling, expanding it so that after a couple of light hammer blows the shaft stump dropped out. The shaft was then turned to fit the old coupling, the coupling lifted up, its flange trued with the same arrangement that had been used for turning the shaft. The empty space remaining between the two halves of the coupling was filled with a piece of piping from the scrap heap, Fig. 3. The transmission thus repaired had a

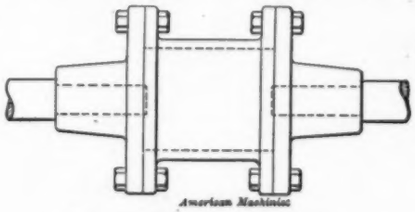


FIG. 3. COUPLING REPAIRED

somewhat unusual appearance, it is true, but work could be resumed after a 16-hour shutdown. A reserve shaft was

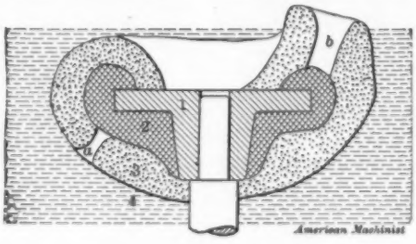


FIG. 2.

1. Half coupling. 2. Space to be filled with molten lead. 3. The mold. 4. Sand.

then ordered, but it has not been put in because the repaired arrangement has given no cause for complaint.

Pilsen, Germany. FRANZ WALENTA.

Reaming a Tapered Hole on the Automatic Screw Machine

In Fig. 1 is seen a piece made from 1-inch diameter brass, which is made on the No. 2 Brown & Sharpe automatic screw machine. Referring to the sketch, it is noticed that the piece is to be slotted in one end and counterbored in the other end. Now, if this piece be made in the usual way, that is, with a tapered reamer, then the slotting and also the counterboring would have to be done in separate operations.

It being decided to finish the piece in one operation, or rather with one setting of the machine, a tool as shown by Fig. 2 was designed to taper the hole after it had been reamed with a straight reamer.

The tool for cutting the taper is shown at *a* and is held in place by the set screw shown. This tool is somewhat smaller than the diameter *a* in Fig. 1. The holder for this tool consists of two parts, *b* and *c*. The part *c* is flat on one end to fit in the part *b* which is slotted to fit it; this slot is shown in Fig. 3, and *b* is the shank of the tool which fits in the turret. At *d*, Fig. 1, is seen a pin on which the reamer holder swings.

In operation, after the hole has been centered, drilled and reamed, we are ready to cut the taper. The turret brings the special reamer forward and enters the hole, dwelling here while the back cross

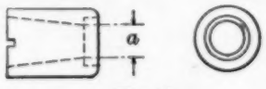


FIG. 1

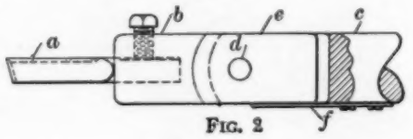


FIG. 2

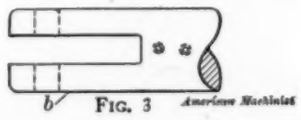


FIG. 3

SCREW-MACHINE TOOLS FOR REAMING A TAPER HOLE

slide comes forward with a "pusher" fastened to the back tool post.

This pusher comes in contact with the tool at the point marked *e*, Fig. 2, and being fed forward the required amount by the back-slide cam the desired taper is cut. The tool is used only for this one piece and not for any other taper. After the taper is cut and the back slide has withdrawn, the taper tool has resumed its spring *f*, Fig. 2.

The number of seconds required to make one piece is 45 and the net product is 800 in 10 hours.

It may be thought by some that the use of the straight reamer is unnecessary, but this is used to provide a smooth and accurate hole to take the pilot of the counterbore.

Cleveland, O. S. N. BACON.

An Experience with High Speed Twist Drills

Mr. Dupont's query, "How Can Twist Drills be Hardened," on page 694, calls to mind an experience I had with high-speed twist drills of a standard make.

My attention had been called to the large number of broken drills turned in by the workmen, and I began to look for the trouble, as several men had been fired on account of the breakage; it being blamed to them.

In defense of the drills I will say that they were being worked to the limit on steel forgings and iron and bronze castings, some of which had cored holes.

After looking over the broken drills I found that about 75 per cent. of the breakage was at the lower end of the taper shank. It was not necessary to use a glass to see that the steel in the shank and that in the drill body were not the same. In some places "cold shuts" could be seen, and the steel in the shanks showed very coarse crystals, which indicated to me that the shanks were made of cheap steel and electric welded to the drill body.

In those cases where the drills had broken in the body, the fracture showed very long, ragged edges, and the grain was fine as satin, indicating that there was no fault in the steel or tempering. The manufacturers were asked to make good, which they did.

Beloit, Wis. M. E. HOAG.

Diameters of Shell Blanks

The table herewith shows the diameters of blanks for shells ¼x¼ inch o 6x6 inches inclusive, by ¼ inches. The figures were obtained by the formula given in the AMERICAN MACHINIST Hand Book:

$$\sqrt{d^2 + 4\,dh},$$

where,

d = Diameter of finished shell.

h = Hight of finished shell.

They were also checked by figuring on the area of the metal.

If it is desired to pinch the metal in one or more operations, get the mean hight of the shell by the following formula;

$$m = \frac{ht}{T},$$

where

m = Mean hight of finished shell,

h = Hight of finished shell,

t = Thickness of finished shell,

T = Thickness of metal before drawing.

Suppose for example, a shell 2 inches diameter by 6 inches high; thickness of metal before drawing, 0.040 inch; finish thickness of shell, 0.020 inch. Then

$$m = \frac{ht}{T} = \frac{6 \times 0.020}{0.040} = 3 \text{ inches}.$$

By using this hight, from table we find a

SHELL BLANK DIAMETERS TO BE OBTAINED BY WEIGHT CALCULATION

shell 2 inches diameter by 3 inches high requires a blank 5.29 inches diameter.

When the shell has rounded corners at the bottom, subtract the radius of the corner from the figures given in the table. Thus; in the last example, suppose the shell to have a radius of ⅛ inch on the corner; 5.29 — 0.125 = 5.165 inches, the required diameter of the blanks.

When a shell has a cross-section similar to the ones shown in the cut, the required blank diameter may be calculated by the following formula;

$$d = 1.1284\sqrt{\frac{W}{wt}},$$

where

d = Diameter of blank in inches;

W = Weight of shell;

w = Weight of one cubic inch of the metal;

t = Thickness of shell.

To prove this formula, suppose a certain shell similar to the ones shown, is to be made of aluminum, and that we know the diameter and thickness of the blank to be 3 inches and 0.025 inch, respectively. Then, as 1 cubic inch of aluminum weighs 0.096 pound, the blank weight is:

$3^2 \times 0.7854 \times 0.025 \times 0.096 = 0.01696464$, or 0.01696 pound.

By the formula, this would be;

$$d = 1.1284\sqrt{\frac{W}{wt}} = 1.1284\sqrt{\frac{0.01696}{0.096 \times 0.025}}$$

$$= 1.1284\sqrt{7.067} = 1.1284 \times 2.6583 = 2.99982572 \text{ inches},$$

which is really 3 inches; the slight difference is due to decimals.

C. P. MACARTHUR.

Waterbury, Conn.

The Open Shop

The trouble with me is that I have been turned down for the first time in my life and not allowed to look through a machine shop. In saying that this is the first time I ought to say that my experience has been tempered in much the same way that influenced my early financial career.

When I was a boy I used to brag that my father never refused me pocket money. I was very careful not to ask him except at the proper psychological moment and also to have a very good reason for needing it.

In the same way I have been very careful about asking admission to shops in that I have waited till I had a good excuse for being admitted. In this case I had no excuse except a desire to know more, which excuse apparently had the

Shell Diameter.	HIGHT OF SHELL.																								
	¼"	½"	¾"	1"	1¼"	1½"	1¾"	2"	2¼"	2½"	2¾"	3"	3¼"	3½"	3¾"	4"	4¼"	4½"	4¾"	5"	5¼"	5½"	5¾"	6"
¼"	0.56	0.75	0.90	1.03	1.14	1.25	1.35	1.44	1.52	1.60	1.68	1.75	1.82	1.89	1.95	2.01	2.08	2.14	2.19	2.25	2.30	2.36	2.41	2.46
½"	0.87	1.12	1.32	1.50	1.66	1.80	1.94	2.06	2.18	2.29	2.40	2.50	2.60	2.69	2.78	2.87	2.96	3.04	3.12	3.21	3.29	3.36	3.44	3.50
¾"	1.14	1.44	1.68	1.89	2.08	2.25	2.41	2.56	2.70	2.84	2.97	3.09	3.21	3.33	3.44	3.54	3.65	3.75	3.85	3.95	4.04	4.13	4.22	4.31
1"	1.41	1.73	2.00	2.24	2.45	2.65	2.83	3.00	3.16	3.32	3.46	3.61	3.74	3.87	4.00	4.12	4.24	4.36	4.47	4.58	4.69	4.80	4.90	5.00
1¼"	1.68	2.01	2.30	2.56	2.79	3.01	3.21	3.40	3.58	3.75	3.91	4.07	4.22	4.37	4.51	4.64	4.77	4.91	5.03	5.15	5.27	5.39	5.50	5.62
1½"	1.94	2.29	2.60	2.87	3.12	3.36	3.57	3.78	3.97	4.15	4.33	4.50	4.66	4.82	4.98	5.12	5.27	5.41	5.55	5.68	5.81	5.94	6.06	6.18
1¾"	2.19	2.56	2.88	3.17	3.44	3.68	3.91	4.13	4.34	4.53	4.72	4.91	5.08	5.26	5.41	5.58	5.73	5.88	6.03	6.17	6.31	6.45	6.58	6.71
2"	2.45	2.83	3.16	3.46	3.74	4.00	4.24	4.47	4.69	4.90	5.10	5.29	5.48	5.66	5.83	6.00	6.16	6.32	6.48	6.63	6.78	6.93	7.07	7.21
2¼"	2.70	3.09	3.44	3.75	4.04	4.31	4.56	4.80	5.03	5.25	5.46	5.66	5.86	6.05	6.23	6.41	6.58	6.75	6.91	7.07	7.23	7.39	7.54	7.69
2½"	2.96	3.36	3.71	4.03	4.33	4.61	4.87	5.12	5.36	5.59	5.81	6.02	6.22	6.42	6.61	6.85	6.98	7.16	7.33	7.50	7.66	7.82	7.98	8.14
2¾"	3.21	3.61	3.98	4.31	4.62	4.91	5.18	5.44	5.68	5.92	6.15	6.37	6.58	6.79	6.99	7.18	7.37	7.55	7.73	7.91	8.08	8.25	8.41	8.58
3"	3.46	3.87	4.24	4.58	4.90	5.20	5.48	5.74	6.00	6.25	6.48	6.71	6.93	7.14	7.35	7.55	7.75	7.94	8.12	8.31	8.49	8.66	8.83	9.00
3¼"	3.71	4.13	4.51	4.85	5.18	5.48	5.77	6.04	6.31	6.56	6.80	7.04	7.27	7.49	7.70	7.91	8.11	8.31	8.50	8.69	8.88	9.06	9.24	9.41
3½"	3.97	4.39	4.77	5.12	5.45	5.77	6.06	6.34	6.61	6.87	7.12	7.36	7.60	7.83	8.05	8.26	8.47	8.67	8.87	9.07	9.26	9.45	9.63	9.81
3¾"	4.22	4.64	5.03	5.39	5.73	6.05	6.35	6.64	6.91	7.18	7.44	7.69	7.92	8.16	8.38	8.61	8.82	9.03	9.24	9.44	9.63	9.83	10.02	10.20
4"	4.47	4.90	5.29	5.66	6.00	6.32	6.63	6.93	7.21	7.48	7.75	8.00	8.25	8.49	8.72	8.94	9.17	9.38	9.59	9.80	10.00	10.20	10.39	10.58
4¼"	4.72	5.15	5.55	5.92	6.27	6.60	6.91	7.22	7.50	7.78	8.05	8.31	8.56	8.81	9.04	9.28	9.50	9.72	9.94	10.15	10.36	10.56	10.76	10.96
4½"	4.98	5.41	5.81	6.19	6.54	6.87	7.19	7.50	7.79	8.08	8.35	8.62	8.87	9.12	9.37	9.60	9.84	10.06	10.28	10.50	10.71	10.92	11.12	11.32
4¾"	5.22	5.66	6.07	6.45	6.80	7.15	7.47	7.78	8.08	8.37	8.65	8.92	9.18	9.44	9.69	9.93	10.16	10.40	10.62	10.84	11.06	11.27	11.48	11.69
5"	5.48	5.92	6.32	6.71	7.07	7.42	7.75	8.06	8.37	8.66	8.94	9.22	9.49	9.75	10.00	10.25	10.49	10.72	10.95	11.18	11.40	11.62	11.83	12.04
5¼"	5.73	6.17	6.58	6.97	7.33	7.68	8.02	8.34	8.65	8.95	9.24	9.52	9.79	10.05	10.31	10.56	10.81	11.05	11.28	11.51	11.74	11.96	12.18	12.39
5½"	5.98	6.42	6.84	7.23	7.60	7.95	8.29	8.62	8.93	9.23	9.53	9.81	10.08	10.36	10.62	10.87	11.12	11.37	11.61	11.84	12.07	12.30	12.52	12.74
5¾"	6.23	6.68	7.09	7.49	7.86	8.22	8.56	8.89	9.21	9.52	9.81	10.10	10.38	10.66	10.92	11.18	11.44	11.69	11.93	12.17	12.40	12.63	12.85	13.08
6"	6.48	6.93	7.35	7.75	8.12	8.49	8.83	9.17	9.49	9.80	10.10	10.39	10.68	10.95	11.23	11.49	11.75	12.00	12.25	12.49	12.73	12.96	13.19	13.42

DIAMETER OF BLANKS FOR SHELLS, ¼x¼ INCH TO 6x6 INCHES.

opposite affect on the shop people to what I expected.

I have been trying to imagine the state of mind that a man must have in order to refuse to admit visitors. I do not think these people have anything of which they are ashamed for I sent one of my foremen down to see and he reported no difficulty getting in the back way, and everything appeared to be workmanlike.

It cannot be that they have secret processes for their output consists of machinery which, while excellent in its way and of uptodate design, is of a type which is well established and which anyone can enter upon. They are not pioneers, in fact they have only lately entered upon their manufacturing career.

It cannot be that they are working out new designs, for I asked my man to look out for that in particular.

If they were doing something that involved the heat treatment of steel I can imagine their wishing to keep that secret but their forge shop is a separate building.

If I were an insurance agent or a book agent I could realize a good excuse, but I am not in either business.

It Might Have Been Profitable to Admit a Visitor

On the other hand I can imagine a number of ways in which it might have been profitable for them to have shown me around their place. For one thing I might have told them how some detail of their work was being more efficiently done in another shop.

I might have had an idea suggested to me by something in their shop which when presented to them might have been worth the cost of showing me about.

I might have seen something which the AMERICAN MACHINIST would like to describe, thereby giving them that much sought after thing publicity.

I might have seen them using supplies and I might know someone who had better bargains to offer in those supplies. Out of friendship to both I might have brought them together.

I might have wanted to buy something which they manufacture and might have been sufficiently impressed by what I saw to order of them.

I might not have wanted to buy but might have known a dozen people who did and to whom I might have said a good word.

So much for negative and positive reasons why they might have profitably allowed me to see their shops. Now for a reason which seems a very real one to many shop owners. I might have been connected with some of their competitors! I might have learned something about what they were doing and used it for their competitor's benefit. To this I think I would reply that the competitor who needs to find out how you do your work is no competitor at all. The man who cannot originate but has to copy is not a man who is to be feared at all. It would seem that a man might be a fine mechanic, capable of doing a good job of any kind and yet able to copy another man's design and copy it so exactly that it would be as good or better than the sample.

It seems, however, that a man who is morally deficient to such an extent that he will deliberately appropriate ideas that belong to another is almost sure to change things enough to cover his theft *and also* to make the design inferior. This has happened so often as to make it an almost universal rule.

I remember designing some machinery for a man who was so afraid that his competitor would find out what he was building that he would not even stop and speak to me in front of their shop. A few years later I told him that this same competitor wanted me to design some machinery for him to use to make an imitation of his goods. He told me to go ahead and design it and soak them good and plenty for the work for he said, "The chumps haven't brains enough to use the machinery if you do build it for them."

Springfield, Mass. ENTROPY.

Reaming Locomotive Bell Yokes

This drawing shows method used to ream bell-yoke frame bearings and can be done without removing the yoke from boiler, as we used to do before this tool was designed. This tool brings the two bearings in perfect alinement without any skill on the part of operator.

We have a number of shell reamers that enlarge in 1/32 inch and fit on end of arbor, being driven as shown by ¼-inch dowel pin. The tapered steel washer holds the one end of arbor central, while the reamer is reaming out opposite hole, and when this is done, the operation is just reversed, which brings both bearings in line. The spring shown applies the feed on shell reamer and the tension is held on spring by washer and thumb nut, as shown. This is a very successful homemade labor-saving tool.

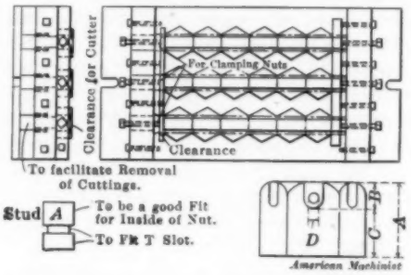
Clinton, Iowa. W. J. SHADLE,
Shop Foreman, C. B. & Q. Ry.

Jig for Holding Castle Nuts While Cutting Slots

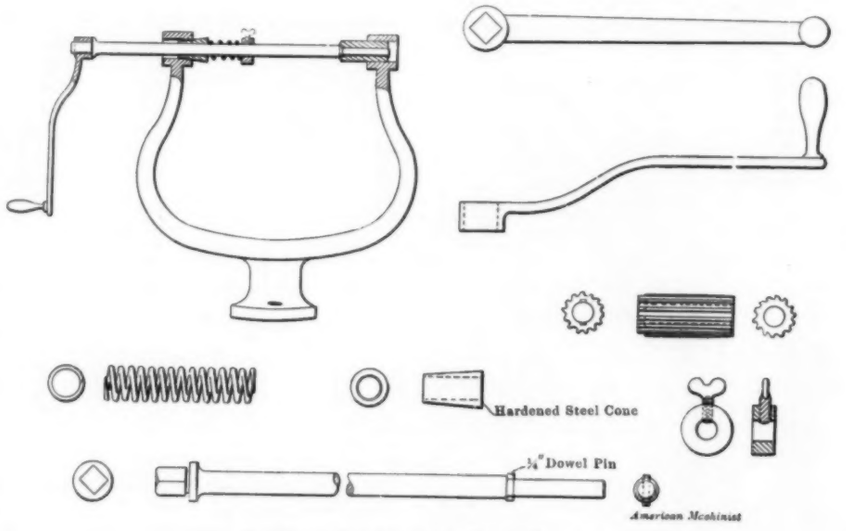
In the works of the Canadian Pacific railway, at Montreal, a jig similar to the one shown in the cut is used for holding nuts so that they may have the slots cut in them. The machine used is an old universal milling machine, which is operated by an apprentice. The only difficulty, if it may be termed such, is that for every size of nut there must be a different-sized stud. This jig enables the company to turn out approximately, thirty ⅞-inch, twenty-six 1-inch, twenty-

Diameter of Bolt	A	B	C	D	Width across Flats *
⅞"	1⅛"	7/16"	11/16"	⅝"	1 7/16"
1"	1¼"	7/16"	25/32"	¾"	1⅝"
1⅛"	1⅜"	½"	⅞"	⅞"	1 13/16"
1¼"	1½"	½"	1"	15/16"	2"
1⅜"	1⅝"	⅝"	1⅛"	1 1/16"	2 3/16"
1½"	1¾"	⅝"	1¼"	1 3/16"	2⅜"

* These are the only Dimension for the Unfinished Nut.



JIG FOR SLOTTING CASTLE NUTS



REAMING LOCOMOTIVE BELL YOKE

four 1⅛-inch, twenty-two 1¼-inch, eighteen 1⅜-inch or eighteen 1½-inch nuts every 45 minutes.

Quebec, Can. G. C. WHITE.

Piercing Dies and Drill Jig for Brass Casting

The three tools illustrated herewith, are uséd on the piece shown by Fig. 1, a brass casting, being a part of a typewriter manufactured in France.

The first operation on the piece is milling the surface *A*, after which the holes *B* are pierced in the punch and die, Fig. 2.

The latter tool operates as follows: The casting is placed as shown in Fig. 2, in position in the die, one end locating against the pin *A*, and the other end locating against *B*. The handle *C* serves to clamp the piece in position, and causes

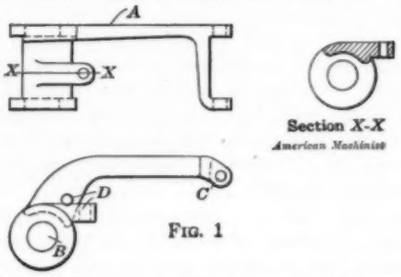


FIG. 1

THE PIECE TO BE PIERCED AND DRILLED

the die is set, it is only necessary to remove the screw *D*, reverse the handle *C*, and the casting will locate against the locating pin on the opposite side of the die.

The holes at *C*, Fig. 1, are next pierced

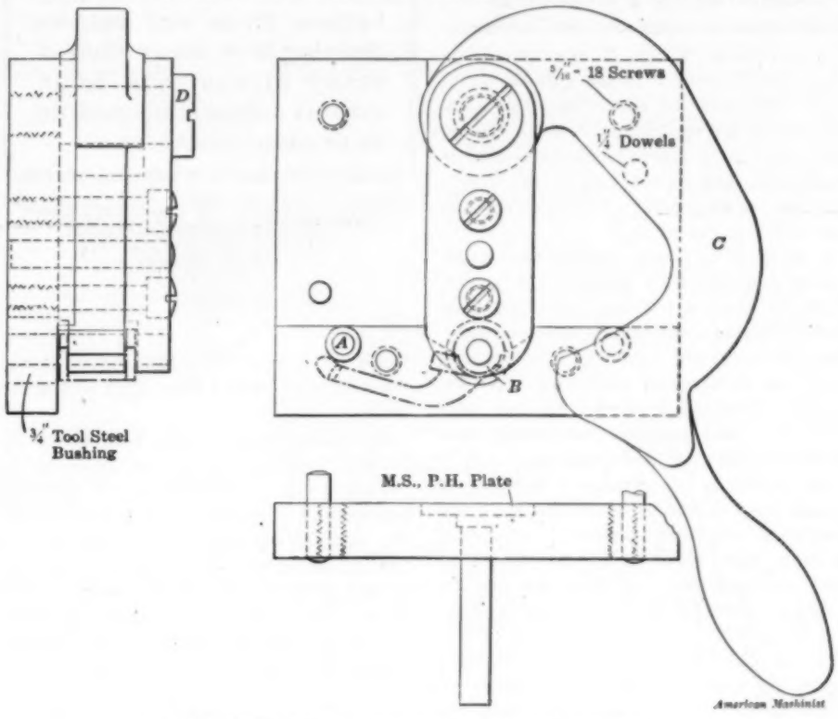


FIG. 2. FIRST OPERATION; PIERCING LARGE HOLES

is pulled out, the gage plate fastened on the opposite side of the die, and the other locating pin is used.

The holes *D*, Fig. 1, are drilled in the jig Fig. 4. The piece is located in the jig by means of the pierced holes, and

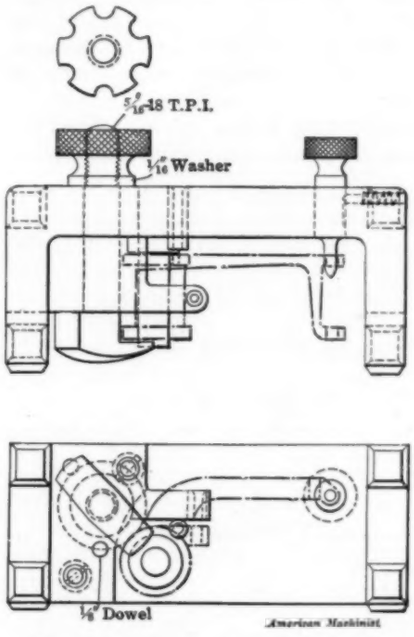


FIG. 4. JIG FOR DRILLING HOLES *D*

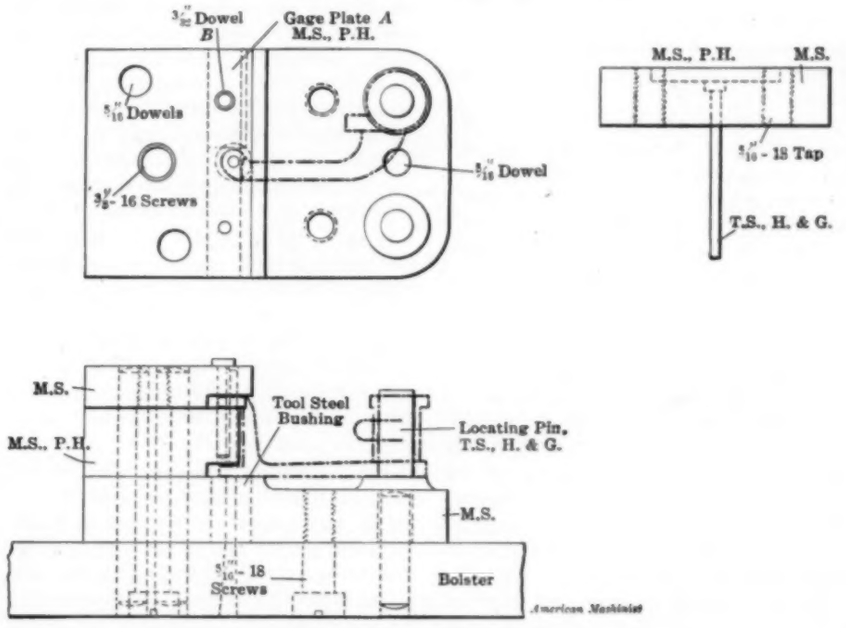


FIG. 3. PIERCING THE SMALL HOLES

it to locate snugly. It will be noticed on the die that there is but a thin wall surrounding the hole for the punch, but this has been found ample in practice.

The handle *C* is made reversible, as the castings are made right and left. When it is desired to change the die for castings of the opposite hand from those for which

in the punch and die, Fig. 3. The piece is located in this die by the holes pierced in the previous operation, and by the other end resting against the gage plate *A*. This gage plate is held by the dowel *B*, which is provided with a head for easy removal. When it is desired to set up the die for the opposite casting, the dowel

clamped by the hook bolt *A*. It is necessary to have two jigs for drilling the last set of holes, one right and one left.

Piercing holes in such pieces as the one above described is somewhat unusual, and the tools should prove of interest to many readers.

Philadelphia, Penn. T. H. HARRIS.

Discussion of Previous Question

Calibrating Pyrometers

Letters from our readers showing how many men of many minds look upon various subjects opened up in previous numbers.

I note what W. H. D. has to say on page 505, in regard to the calibration of pyrometers and the use of the lead bath. He asked me to acquit him of having intentionally misquoted me, but this is impossible when he refers to the freezing and melting point of sodium carbonate as being the same.

I state that I use sodium carbonate, which melts at 1497 degrees Fahrenheit. This, he calls a serious error and says that of a large number of ordinary samples he examined he found the freezing point to be between 1544 and 1550 degrees. Thus there would be but very little error in presuming that sodium carbonate solidifies at 1550 degrees.

In admitting this error of 6 degrees we would have to add to it the reading error and we would be no better off after calibration than before. I have failed to find any authority that gives the melting point or even the freezing point as high as does W. H. D. by as much as 40 degrees. The melting point and freezing point are not the same, as he states on page 505. Neither does he have the right to say that I admit it to be the same in Volume 32, Part 2, page 1078, for I state there that I got readings in three ways, and was finding some difference in the melting and freezing points.

It is true, I do say that the sodium carbonate must be chemically pure, but this does not denote that its melting point in all cases will always be the same for I said "there is not any two authorities that give it the same, and this is probably due to the process of manufacturing."

Melting Points

He next asks why I misquote him in giving the melting point of antimony. I did quote him as saying that antimony melts at 1159 degrees, whereas, it should have been 1169 degrees. I am sorry for this, but am still of the opinion that antimony of 6.712 specific gravity melts at 1150 degrees and thus the correction is worse than the mistake.

He next gixes a table of melting points by C. U. Scott and W. H. D. and questions the purity of my material. If he is not correct in this guess he is inclined to think that my authority is at fault. As stated on page 791, Part 1, Volume 33, my letters are usually from my own experience. If W. H. D. tells me how to find certain results with certain material or combination of materials and I do it, it then becomes a part of my own knowledge from information based on facts. Such facts from actual experience is what I work with and write from.

In another place, I note that W. H. D. is still melting his sodium chloride at 1472 degrees. That may be all right, as I have seen it melted at 1492 degrees but the sodium chloride that I use has a melting point of 1421.6 degrees. By referring to the accompanying chart, it will be seen that if we are allowed any credit for being able to determine the melting points, there is cause for the claim.

Calibration

In order to fully verify our calibration, the dial of our recording pyrometer was arranged so it would revolve once per hour. Before the chart is examined, I wish to say that we keep from 6 to 10 fire ends in stock and the pyrometers are calibrated with a fire end that we do not misuse. In order to check this test we use the non-magnetic point to prove the correctness of the instrument.

In using this point we must know that the non-magnetic point is somewhat higher than the recalescent point, in fact, we find it to be close to 1400 degrees, say from 1400 to 1409 degrees. If the pyrometer registers close to these points, it is doubtless a safe instrument to determine the melting points of sodium chloride.

The calibrating was done with sodium chloride with a melting point of 772 degrees Centigrade or 1422 Fahrenheit. First the heat was run up until the sodium was melted, then the fire end was made fast to an overhead apparatus that allowed it to swing entirely free from the bottom and sides of the crucible. Then the fire was shut off and the rapidity of the fall in temperature was noted; the time being recorded with a vibrator accurately operated by a clock movement.

I stated in my previous letter that I was inclined to favor the solidifying point as the point for the reading in calibration, as the tendency to hold heat was much greater at this point than any other place. This is well illustrated in the chart, which may not appear to represent much care but is one of the finest charts I have made. All of the readings were taken with the retaining vessel in place in the furnace.

That the pyrometer was operating correctly was shown by the fact that it indicated the non-magnetic point correctly and also calibrated correctly with the standard fire end of another instrument. A man at the pyrometer recorded the readings while another took the readings at the furnace and was entirely ignorant of the temperature indicated by the pyrometer. It indicates the non-magnetic point correctly and its readings are correct for all of the higher heats.

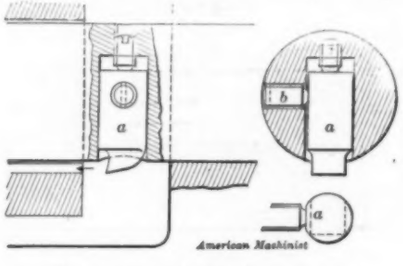
Lead Bath

In regard to the lead bath, he says the lead dissolves its own oxides and sulphates. Next he claims that the cleaning of the work and the lead, as well as keeping a reducing atmosphere on its surface is sufficient to condemn it. As to cost, I am now hardening small punch and threading dies, profile cutters, end mills, taps, reamers, punches and various tools for one tenth of a cent. This includes the labor for hardening, tempering and cleaning. If there is any salt solution in which tools can be hardened at the above price we would be glad to hear of it.

Davenport, Iowa. C. U. Scott.

Keyseating Long Bushings

At page 224, Volume 33, Part 1, Mr. Hargrove describes a new device for keyseating bushings and I may be permitted to make known a similar contrivance which has advantages over that already



Keyseating Long Bushings

shown. The tool *a*, made from a round steel bar, is somewhat flattened off on the sides, and lightly fitted in a hole bored in the draw bar. The screw *b* clamps it fast and prevents it from turning; screw *c* regulates the depth of cut. With this device both straight and helical grooves can be cut. The helical ones are pro-

duced by means of a helical groove of equal pitch milled in the draw bar; a wedge-shaped finger fixed in the guide housing enters this groove. So far as the pitch was great enough no difficulties whatever were encountered in our work.

Cöln-Deutz, Germany. K. MUNZE

Punch Press Work on the Automatic Screw Machine

The parts described in this article were made on the automatic screw machines cheaper and some of them better than when made in the press department. The chief reason for this lies in the fact that they are finished on one machine.

The piece shown in Fig. 1 is completed on a No. 00 Brown & Sharpe automatic screw machine. The old method of making them was to form the groove and cut off to length on the screw machine and the bending was done in the press department. The first piece that was finished on the screw machine was bent by accident; experimenting followed with the result that a chuck was made bell-mouthed, as shown in Fig. 2; a blank form tool bending the wire while the spindle was stopped the same as for cross drilling.

In operation, we cut off and form the groove; feed the stock and stop the spindle; bend with the tool on the rear slide; feed the stock, the time for one piece being 4 seconds, or a gross product of 9000 in 10 hours.

In Fig. 3 we have a piece with two bends in it. This piece is threaded, bent, cut off and slotted on the No. 00 Brown & Sharpe screw machine, a special slotting bushing being used to carry the piece to the slotting saw.

Fig. 4 shows how the piece is bent. At *a* is seen the square form around which the wire is bent; this square is hinged to plunger *a*, shown in Fig. 5. The plunger is brought forward until the front end is raised and stopped by the special tool *b*, Fig. 4. This tool (fastened to the back tool post) now comes forward and the part marked *c* bends the wire around *a*, thus making the first bend which forms a right angle; the back tool then retreats just far enough to leave *b* still engaged.

The tool, Fig. 5, now comes forward and the body bends the threaded end of the piece around plunger *a* which has remained stationary, being stopped by *b*, Fig. 4.

In Fig. 5 will be noticed a spring fastened to the hinge pin; the end of the plunger is pressed down by this spring as soon as the back slide retreats so that when the turret moves back to revolve the tool will be disengaged from the work. The threads are cut close to the spindle just after the piece is cut off. The time required to make one piece is 6 seconds.

A blanking job was the next piece on which a large saving was made. Fig. 6 shows the blank and a pierced hole, while Fig. 7 shows the piece as it was formed. The old order of operations for this piece was: First, blank and pierce hole; second, bend or form to shape; third, solder around base shown at *a*, Fig. 7, and the fourth operation was tap the hole on a hand screw machine. The operations are now all performed on a No. 0 Brown & Sharpe automatic screw machine with the result of twice the former product with one-half the former cost.

The man who has anything to do with rush orders knows what it means when a piece is made with several operations in different departments; there is always delay in one or more operations. In Fig. 8 is shown the piece as completed on the screw machine; it is now possible to have a heavy bottom with the rest of the piece light; besides the soldered part always gave trouble. The open part shown by *c*, Fig. 8, is cut with the screw-slotting attachment.

The operations follow: Feed stock to stop; center; drill large hole; ream large hole; drill small hole; tap; cut off. The time required to make one piece is 30 seconds.

The next piece was transferred from the press department to a No. 2 Brown & Sharpe automatic screw machine. Fig. 9 shows how the piece was made up of two parts, the cup and the hub, held together by three screws. This piece was made for years by the old method, which was: First, make hub in screw-machine department; second, drill and tap hub in drill-press department; third and fourth, blank, form and pierce in press department; fifth, make screws in screw-machine department; sixth, assemble in bench department. This is now made in a solid piece on one machine and the cost of manufacturing by the old method is divided by four.

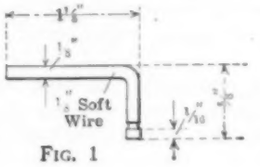


FIG. 1

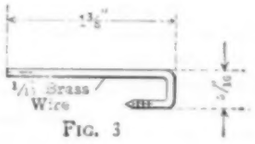


FIG. 3

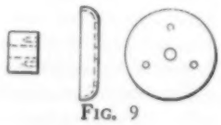


FIG. 9

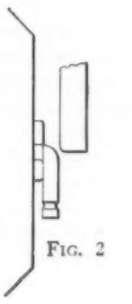


FIG. 2

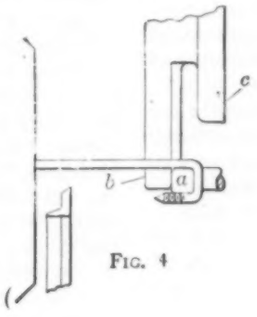


FIG. 4

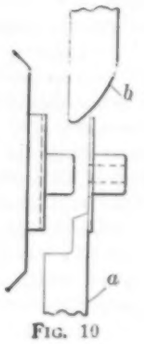


FIG. 10

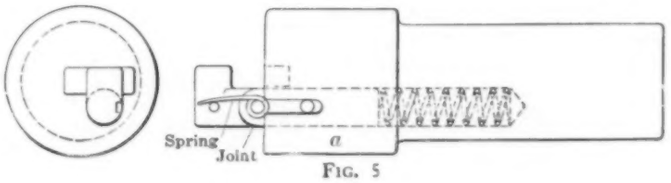


FIG. 5

FIG. 6

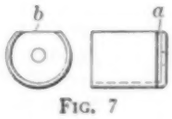


FIG. 7

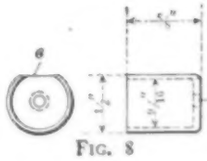


FIG. 8

PUNCH-PRESS WORK ON THE SCREW MACHINE

Fig. 10 is a view of this piece being completed on the automatic screw machine. The cutoff tool severs the piece and also forms the hub. When this tool has cut in about the distance shown in Fig. 10, the special form tool (shown on the back slide, at *b*), comes forward and spins the flange over, making it cup shape. The form tool differs from the usual circular tool in that it has no cutting edge, it being made in a complete circle. This job worked so well that the foreman secured a comparison of costs from the office and took it around to show the "old way is the best way" fellows.

Cleveland, O. S. H. BACON.

Training Mechanics in Germany

By John M. Shrigley *

A complete indorsement of our recent article on this subject by one whose knowledge of the facts no one can doubt.

*President, Williamson Free School of Trades.

I have read with very great interest the article by Mr. Halsey, on page 759 of the AMERICAN MACHINIST, on "Training Mechanics in Germany," and wish to say that it entirely agrees with my experience in the matter of trade training abroad. Nearly two years ago you published a communication from me on the subject, in which I ventured to say that the estimate placed on trade-school training in schools in Europe was much exaggerated, and that there would be evolved in the United States a general scheme of that form of education which would lead the world. Another visit to Europe last summer confirmed very emphatically these views.

The special attention which Mr. Halsey calls to the radical difference between our conception of trade teaching in schools, and that existing in Germany is most timely. Some of this divergence, as he suggests, is due to the names given to the German schools.

I well remembered my surprise when, some years ago, I learned that a Handwerkerschule did not have handwork as a part of its curriculum, but was simply an academic school for hand workers.

In this connection I would add that last June I had the pleasure of visiting Director H. Back, of the Gewerberschules (industrial schools), of Frankfort, Germany. Mr. Back told me that no hand work beyond mechanical drawing was being done in any of the schools of that great German city; all preparation for shop work being made under the apprenticeship system in commercial establishments, the schools giving only training to apprentices in mathematics and drawing. Mr. Back, who is an intelligent, well informed man, and who knows what the American conception of trade schools is, having visited America, informed me that he knew of no school in Germany which teaches trades.

Some two years ago, a leading educator in another large German city, who had not then visited the United States, told me that he knew of but one such school in his country. I promptly visited it and found it to be a very poorly housed and illy equipped cabinet-making shop, producing low-grade furniture. Most of the work was being done by journeymen, assisted by some undersized small boys, who received no systematic training of any sort.

I learned from him that the apprentices in the Frankfort shops are paid per week as shown in the table, the value of a mark being about 24 cents.

In a visit to the very important manufacturing city of Charleroi, Belgium, last summer I had the pleasure of meeting Director Omer Buyse, who has charge of the industrial instruction in the schools of the province of Hainaut, and found that some hand work is being done in his schools, but only preliminary or supplementary to a regular shop apprenticeship course. Mr. Buyse is a very intelligent, progressive man, anxious to help the mechanics of his country, but is hampered by social and economic conditions. He told me that the average workman in Belgium is not intellectual and is without social position or ambition, but he hopes this condition will be modified by more general and generous school work, and that the day will come when mechanics will have as good standing in the community as professional men, and then they will be trained in their trades in schools especially established for that purpose, as is now done in the professions.

	1st Year. Marks.	2d Year. Marks.	3d Year. Marks.
Bricklayers	3 to 4	5 to 6	9 to 10
Plasterers	3 to 5	5	8
Machinists	1 to 2	3 to 4	4 to 5
Carpenters	1 to 2	2 to 3	3 to 4

He visited the United States about three years ago and in 1908 published a large, illustrated work on American methods of technical education in which he describes one of our trade schools (the Williamson) as eclipsing any similar institution in Europe. He added to this statement when I met him this summer by saying that the fine educational vocational work being done in the United States was not appreciated either in America or in Europe. I regard this as a very significant and important statement, as Director Buyse is familiar with the European system as well as the methods being tried in our country.

When in Scotland I consulted one of the leading authorities on technical matters, Secretary Stockdale, of the Glasgow Technical College, who told me that Scotland had no trade schools, and the superintendent of schools in one of the larger English cities, who had visited this country, informed me that he knew of no trade schools in England, in the American sense of the term. I inferred from what I learned on various visits to Great Britain that the profit derived by the employers from their apprentices induces them to look with disfavor on schools for technical trades.

This reminds me to say that in Frankfort, Germany, I visited with Director Back the shop school of Hartman & Braun, and found it to be the best of its type I have seen anywhere. The apprentices spend 45 hours per week on instructional work in a pleasant room entirely devoted to their training, and eight hours per week in drawing and mathematics at the public schools. The exercises are well graded and include many small tools used in the works, but nothing is made for sale. The young men are doubtless well fitted for the special knowledge required in that particular manufactory. Doctor Hartman told me that the school had been in existence for six years and that there was no financial gain in it, but that the expense of running it was 10,000 marks per annum (nearly $2500). The number of learners is small. On the completion of the course the young workmen are started in the manufacturing department at about 90 cents per day, or a little less than full journeymen's wages.

Numerous inquiries abroad from reliable sources justify me in saying that the much vaunted European system of trade training results in producing journeymen who, as a rule, cannot look for more than about one dollar for 10 hours' work, and this in countries where many of the necessities of life are quite as costly as in the United States. Other causes doubtless contribute to this unfortunate condition of affairs, but education, or rather the lack of it, must take its share of the blame.

I am confident that the system of making mere special operatives, while apparently gainful to the employers, detracts from the potential value of the men, and limits their opportunities of earning proper wages.

My experience indicates that European catalogs sometimes seem to imply the teaching of trades in schools, which only give a little work supplementary to shop apprenticeships.

I have personal knowledge of the fact that some of the European leaders, in the effort to place trades on the scholastic basis, are much dissatisfied with the conditions existing there.

There is no question, however, in my mind, that the United States is evolving methods which will keep it in the first rank of mechanical trade-training nations. In this great work our prime consideration must be the welfare of the worker and this will eventually redound to the benefit of the employer.

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American Machinist

Editorial

The Welfare of the Worker

In view of the seemingly radical position assumed in our recent article on "Training Mechanics in Germany" we are more than ordinarily gratified at the prompt verification of that position given by Mr. Shrigley—than whom no one is more competent to speak—in another column.

It is not to this, however, that we desire to especially direct the reader's attention here, but to Mr. Shrigley's sentiment expressed in his last paragraph—"In this great work our prime consideration must be the welfare of the worker."

Right here lies another radical difference in the conditions which obtain in Germany and the United States. It is not too much to say that in the former country the welfare of the worker, so far from being the prime consideration, is the last, if, indeed, it has any place whatever. What we call the institution of individualism, as known in this country, finds no place in Germany. There the individual does not live primarily for himself nor for his family. He lives first of all for the Empire. The welfare of the individual, except as it is bound up in the welfare of the body politic, is considered scarcely worthy of consideration. The individual is nothing; the Empire is everything.

We are not here setting forth the German conception of the relation of the individual to the state in order to condemn it, but simply to point it out and make it plain. There is much to be said in its favor. It means team play on a gigantic scale. It means that the Empire is managed as a vast industrial army and there can be little doubt that it has been a potent factor in German industrial progress.

The point we make is that this condition is foreign to anything that we know at home; that it pervades the entire system of German industrial education, as it pervades everything else in Germany, and that it gives such education there a direction which is impossible here.

The application of this conception of the relation of the citizen and the state to educational matters means that in such matters the prime consideration is not the benefit of the individual, but the progress of the Empire. If a given expenditure for industrial schools devoted to the establishment of advanced technical schools intended to train a small number of leaders of the industries is judged to be more fruitful of progress to the Empire than the same amount of money expended for training a large number for positions in the rank and file, then we may be very sure that the funds will be devoted to the advanced and not the elementary schools.

Almost the entire discussion of industrial education in this country has related to that grade of education suited for those who are to become members of the rank and file, while on the other hand the striking development of German industrial schools is in the advanced and not the elementary grade.

This is but another direction in which lessons have been drawn from the German educational system and applications have been made to our own conditions which are entirely unwarranted. For better or worse we are committed to the gospel of individualism. Our problems in industrial education must be worked out in the light of that gospel, and it is only with the sharpest possible discrimination that lessons can be drawn from a country where it finds no place, where the opposite doctrine is accepted quite as universally as individualism is here.

How to Secure Russian Trade

Builders of machine tools and shop appliances of all kinds will do well to read the article on trade with Russia in this issue, very carefully. Mr. MacIntyre has been in Russia long enough to study the conditions and being right on the spot, sees what is needed to secure a fair share of the business which is developing in that country.

The question of foreign trade has been neglected with comparatively few exceptions, and we have been content to take what happened to come our way without making a real, persistent effort to broaden it. There are a few notable exceptions which serve to show what can be done when the problem is attacked vigorously and persistently.

We are too apt to look to our consuls and to the establishment of American banks to secure results for us, forgetting that the only real and permanent success comes from getting after, and keeping after, the business ourselves. In fact, the notion that someone else will do things for us is generally responsible for their not being done at all.

The first step, as clearly pointed out

in the article, is to get acquainted with Russian conditions, and plan how to meet them. For the trade seems to be well worth going after and should be particularly desirable at a time when the home market is being readjusted by the changing conditions in automobile and other lines.

Many have made the mistake of considering foreign trade simply as a means of filling in between home orders, and have neglected it entirely as soon as business improved in this country. Business amounting to millions of dollars in machine tools alone has been thrown away by this neglect; not a pleasing example of American acumen in business matters.

This business can be won back again and it is well worth the winning. But it can be done only by vigorous work with personal representatives and a determination to consistently take care of the business after we secure it.

We must not expect to secure Russian or any other trade without a persistent and systematic effort, and the sooner we get at the matter in the right way, the sooner the results will appear on the right side of the balance sheet. But the trade of any country which can develop as is indicated in the article referred to, in spite of all its political and social troubles, is well worth making a vigorous effort to secure.

The Tariff Commission

The results of the elections can scarcely fail to give a powerful impetus to the movement for a tariff commission. On the one hand, the defenders of the existing tariff will turn to it as a means of preventing radical action, and on the other hand, sensible tariff reformers can scarcely fail to recognize that "it is a condition, not a theory that confronts us"—that the entire business of the country is adjusted to the tariff, and that, however much they may disapprove of it in principle, its downward revision must be undertaken in the most painstaking, judicial spirit if serious consequences are to be avoided. Then there is that third nonpartisan party, which for years has been saying that "the tariff should be taken out of politics," and who are the fathers of the commission idea as a means of bringing about that result.

All three of these parties can scarcely fail to unite in favor of the commission, leaving only the irreconcilables at the two extremes to oppose it. We do not pretend to forecast the result, further than to predict a growing strength for the commission plan.

At the least, it would seem that the old log-rolling methods of tariff making have disappeared for good. The commission plan is the only one before the public as a substitute, and there can be no question that much good should result from its adoption.

In saying this we do not blind ourselves to the fact that many advocates of the plan, including President Taft, expect far too much from it. In particular, the determination of costs of production in various countries, either absolute or comparative, is clearly beyond the powers of any commission. Without the power to compel witnesses, such a commission can do nothing in determining costs in this country, while with that power it could do nothing abroad, and the exercise of such power at home is not thinkable.

Again, were it thinkable and were it exercised, the whole subject of costs is so complex and subject to such a variety of practices in different industries, as to place their analysis beyond the powers of any conceivable commission.

The idea that any commission can really determine the costs of production among the infinite variety of industries that characterize present day industrial life is simply amateurish and unworthy of serious consideration.

Industrial Education Meeting

The fourth annual convention of the National Society for the Promotion of Industrial Education is scheduled to be held at Perkins Hall, 264 Boylston street, Boston, November 17, 18 and 19. Papers and discussions are announced on the following subjects: "Demands and Opportunities for Girls in Trades and Stores;" "The Training of Teachers for Girls' Trade Schools;" "Apprenticeship and Corporation Schools;" "Part Time and Evening Schools;" "Continuation Schools of Germany;" "The Social Meaning of Industrial Education;" "The Economic Significance of Industrial Education;" "Industrial Education and the Community;" "The Problem of Industrial Education as Seen by the Employer." and "Labor's Demands on Industrial Education." A public banquet will be held at Hotel Somerset, at 6 p.m., November 17. The paper on continuation schools in Germany is by Dr. George Kerschensteiner, superintendent of schools, Munich, Bavaria.

L. C. Smith

L. C. Smith, whose name has been prominently connected with the typewriter and gun manufacturing industries in this country for the past 20 years, died at his home in Syracuse, N. Y., on November 5.

Mr. Smith was born in Torrington, Conn., in 1850. At the age of 25 he became engaged in the manufacture of breech-loading fire arms, to which most of his energy was directed for the succeeding 15 years.

In 1886 Mr. Smith took up the manufacture of typewriters, shortly after which he organized the Smith Premier Typewriter Company, with the works in Syracuse. He remained the president of this company until it was absorbed by the Union Typewriter Company.

In 1903 Mr. Smith, in conjunction with his brothers, organized the L. C. Smith & Bros. Typewriter Company, with headquarters in Syracuse, of which company he was president at the time of his death.

In his later years Mr. Smith showed keen interest in educational movements, a mark of which is his gift, in 1900, of the L. C. Smith College of Applied Science to the Syracuse University, of which he was an active trustee.

Mr. Smith's business interests were not confined to the two fields in which he won prominence, but were of a varied character, including banking ventures, transit developments, shipbuilding operations, and the chairmanship of the board of directors of the Halcomb Steel Company.

Personals*

George Blena, until recently president and manager of the Hygea Ice Company, Ithaca, N. Y., has become consulting engineer of the Modern Ice Machine Company, San Antonio, Texas.

James A. White, until recently assistant engineer in the turbine department of the General Electric Company's Lynn plant, has become works manager of the Worcester (Mass.) Pressed Steel Company.

O. W. Plant, who has been connected with the F. D. Kandall Company as master mechanic, has accepted a position with the R. K. LeBlond Machine Tool Company, Cincinnati, O., where he will take charge of the tool room.

O. Bradley Burgess has been transferred from the New York office of the Standard Plunger Elevator Company to the Worcester plant of this company where he will act as mechanical engineer in charge of the engineering department and drafting room.

F. E. Newell has resigned his position as general foreman of the Vermont Farm Machine Company, Bellows Falls, Vt., to accept one as superintendent with the Williamson Brothers' Company, Philadelphia, Penn. Mr. Newell has been connected with the Vermont Farm Machine Company for nearly sixteen years.

Joseph Schaeffers, who, for a number of years was connected with the Simplex Automobile Company, and later on with J. M. Ellsworth, of 518 W. 22 street, New York, in the building of motor cars, has taken over the American agency of the Lindenberg Steel Mills, Remscheid-Hasten, Germany, with offices at 1451 Broadway, New York.

*Items for this column are solicited.

Shop Representatives' Expenses

By F. L. Eberhardt *
and C. H. Norton †

Abstracts of two papers presented at the Machine Tool Builders' Convention dealing with the question: Who should pay the expenses of a shop representative sent out at the request of the dealer to help close a deal?

*President, Gould & Eberhardt.
†Norton Grinding Company.

Nearly all dealers handle from a dozen to fifty different kinds and makes of machines, and with a limited force of salesmen it would be practically impossible for the latter to be thoroughly posted on each line of machines they are trying to sell; in fact I have found that the factory representatives themselves are sometimes in doubt as to the possibilities of machines, and it is occasionally necessary to make tests before the desired information can be obtained, the conditions varying with each case. In such cases, the agent shows his wisdom in calling on the factory rather than lose the sale. This is where the so called factory "missionary" comes in—the man who combines practical factory knowledge of the capabilities of the different machines with selling ability.

The services of the factory representative are generally required in introducing a new line of machines, with which the agent and his salesmen are not as conversant as with the older line.

This naturally leads up to the qualifications to be possessed by a salesman. One finds a great difference as to the ability and qualifications of various agents and their salesmen, which makes the call for assistance from the factory at times absolutely imperative. I feel more attention should be given this point by the manufacturer, requiring that the agent and his salesmen keep better posted and in better training.

In order for a salesman to be efficient and successful, he must be able to convince his customer that his product is the best one on the market and thoroughly suited to the purpose. He must have a complete knowledge of his own and competing lines, and one of the best places to obtain this is from the manufacturer.

Some manufacturers, recognizing the difficulty of securing agents thoroughly versed in the construction and capabilities of their machines—frequently owing to the technical or special nature of the machines themselves—have established their own agencies, manned by specially trained experts from their factories. And some of these manufacturers claim that direct representation is the only way.

But where we are represented by agencies which handle a number of different makes and kinds of machines, as most of us are, I believe it is fair for the manufacturer to give a reasonable amount of assistance by personal representation with prospective customers, and without seriously considering the question of expense.

The manufacturer should not be required to send a representative too frequently from the factory to assist in effecting a sale. When the size of the order and circumstances warrant, I believe it is good business for this to be done, and the expense to be borne by the manufacturer, or if much of this work were required, the manufacturer and agent might divide the expense. If an agent were compelled to defray the factory representative's entire expenses whenever he felt that the services of the latter were required, it would be simply human nature for him to defer calling on the factory, and he would try to close the order himself, and thus avoid the expense. Such action might be the means of losing sales—not only of that particular order, but also of subsequent orders that would otherwise have benefited both the agent and the manufacturer.

I do feel, however, that this item of expense, which is an added burden on the manufacturer's profit, and which is too often overlooked by the agent and the buyer, could be greatly minimized if the agent would give more attention to the careful selection of his men, see that they are better trained, and afford them more opportunities to frequently visit the manufacturers' shops. Too few salesmen are well or sufficiently posted; too few have the ability to acquire and grasp the practical information which the buyer wishes to know in order to enable him to satisfactorily and confidently make up his mind that the machine in question is going to be the right one for his work, from a practical, economical and modern standpoint. It sometimes happens that a salesman, in offering a machine, will fail to consider whether a customer has other machines of a similar character equipped with tools, fixtures or cutters which possibly it would be advantageous and sometimes imperative to have interchange with the new machine, or he will recommend a machine of insufficient capacity, etc.

I would not, however, overlook the position and responsibility of the manufacturer. He should see that both the agent and his salesmen are amply supplied with all information and assistance to the above end, believing that with a hearty, sincere coöperation, less personal assistance from the factory will be required.

The proper question to ask, it seems to me, is not who shall pay the expenses, but when shall the expenses be paid by the manufacturer, or rather, when shall the agent call on the manufacturer, at the latter's expense, to assist him? It is up to the manufacturer, the agent and his salesmen, and the amount of interest and energy the latter are willing to put into their chosen work.

BY C. H. NORTON

The question is asked: Who shall pay the expenses of a man from the works to assist the agent in securing the order. This question raises other questions which the Norton Grinding Company feel are quite as important:

How can the maker of machine tools be sure that he, or his tools shall be understood before they are sold, and afterward?

How can the maker be sure that the right tool is recommended for the work to be done?

How can he be sure that the right equipment is selected and specified?

And how can he satisfy the customer that the tool is suitable after it is installed?

We have not found it practical to rely upon the agent and his salesman alone for efficient service along these lines. We find the agent and his salesman very helpful to us in introducing our machines, and in the care of customers generally, and we would not think of dispensing with their services, but we do not believe anyone can correctly present a machine tool to a buyer, unless he has either designed it or is familiar with its construction by the actual work of constructing it; or that anyone who has not actually produced work with it can correctly estimate on work for a new customer.

One not familiar with a tool is poorly fitted to defend it against the misstatements of competing agents when in conference with a doubting buyer. We believe it is necessary to train a man in our own works, that shall act with the agents to secure and maintain a correct understanding between the customer and ourselves.

To secure such understanding, it is necessary that someone *who knows* shall present the case, and what is more convincing than to be able to say: "I know, because I have come up in the works where these tools are made, and I will come here to your works and make good, if you buy." It is also necessary that he should go when the tool is sold, and be able to actually teach the workmen to produce work as guaranteed.

We found that we were constantly in trouble because of the lack of mechanical knowledge on the part of the sales-

man, and any effort on their part to familarize themselves with our tools were bounded by a few hours between trains, and without the removal of their cuffs. We felt that we must be represented by trained mechanics—men who had trained in our own works, and who could at all times keep us in touch with all the facts, favorable as well as unfavorable; for it would seem that the average salesman is very quick to fall into the customer's way of thinking, and to rather assist him by assent to the customer's criticism, rather than to defend intelligently the machine he is representing.

A man from the works is better prepared to meet unjust criticisms, and to satisfy the customer of the correctness of his machine, as well as to satisfy the works, of errors they may have made in the machine, and that would justly merit criticism.

We have an arrangement with our agents in regard to commissions, by which we are enabled to furnish a man from the works to work with our agents, although this arrangement does not pay all of the expense; a part of it being borne directly by us. We believe, however, that it is the most profitable way to proceed, and so far, it has worked out well.

At first the plan was looked upon with disfavor by all but one of the agents. Now all agents like it. Our men work with the agents, but continue in our employ, we paying their salary and all expenses. They, of course, do not take the place of the agent and his salesman, nor do they assume anything belonging to the salesman. They work with the salesman, assuming the authority for all estimates and guarantees, explain mechanical features, render intelligent reports to us of all criticisms from our customers, and all defects of our tools as they see them in use.

We believe that in cases where such a plan as we follow is not in force, and when, on occasion the agent shall ask that a man be sent to assist him, that it is for the best interest of the maker to send a man at his own expense, until some arrangement can be made. It has always been our habit to send a man on such occasions, paying all of his expenses. We feel it is for the interest of the machine-tool maker to be more directly represented, and in saying this, we do not depreciate in the least the dealer and salesman.

Scrapping Old Machine Tools

By Frank C. Hudson

A discussion of an editorial bearing on the question of scrapping machine tools more frequently.

This points out the difference between textile work and the machine or railroad field and is a plea for the conservation of the energy put into building the machine tools.

The question of discarding old machine tools is more important than many imagine and yet there is a vast difference between discarding a tool and consigning it to the scrap heap to be melted.

The scrapping of looms or similar machinery has very little if any bearing on the machine-tool question. Manufacturers of textiles must meet the competition of the largest mills in selling their products and the old, slow loom has little place in their mill, no matter how small it may be.

The same condition exists in the machine shops of large manufacturing concerns such as automobile or machine-tool builders, and out-of-date machines should be discarded in many cases where they are now cherished. But instead of scrapping them, which would be a direct waste in most cases, they can be sold to small manufacturers and repair shops which have no parallel in the textile field. Small builders of specialties as well as repair shops, can generally use second-hand machines to very good advantage if they have not been abused by the previous owner or owners.

Repair work or general jobbing does not require high-priced special and single-purpose tools as they have little or no repetition work to handle. Machines which have outlived their usefulness in regular work either from wear or from the advent of new machines of greater capacity, are often nearly as good as new to the small shop or to certain departments of the large shop.

I recall several instances where old lathes which would have brought almost nothing as scrap or even as a second-hand machines, are doing good work as special boring machines on gas-engine cylinders. They have not the capacity of a large special boring machine but they can handle all that must be made and it requires but one man in each case.

I am not an advocate of clinging to old tools when new ones will do the work better as is usually the case. But neither do I advocate smashing them up for scrap as long as they can do good work in some other shop under different conditions.

The ideal condition is to *wear out* tools or locomotives as rapidly as possible in actual work. If a lathe has a capacity of cutting off 10,000 tons of chips before it is worn out, the sooner we can get this work out of it the better. This is what the railroads try to do with locomotives. But instead of wearing them out on the main line and then bestowing them on a scrap heap, or even scrapping them as soon as they become unfit for main-line service, they send them to branch lines where they can handle the work with ease and often economically as well.

As a matter of fact, many locomotives that have been relegated to jerk-water lines can handle main-line traffic more economically than some of the latest, so called uptodate locomotives are doing.

Many of the little locomotives which did such good service on the New York elevated road are still doing duty in many places. Surely this is more desirable then to scrap them when their original work was completed.

The whole problem after all, comes back to a question of personal judgment in each particular case. The shop manager who can always pick the best machine for his work and sell it or scrap it at the proper time, is the wonder of the age. Fortunately for the rest of us he is a scarce article.

But we have the satisfaction of knowing that those who use the best judgment must secure the best results so that no Carnegie medals are necessary to distinguish them from ordinary mortals.

A Permanent Exhibition of Safety Devices

The American Museum of Safety claims that 50 per cent. of the accidents in American industry are preventable. In proof of this, it has established a permanent exposition of safety devices in the Engineering Societies' Building, New York, formal opening of which is to take place on the evening of November 21, in the interests of conservation of life and limb of workmen. It thus becomes a clearing house for every worthy device and every worthy thought concerning safety. It is its purpose to place this new museum idea on the highest plane, namely, the realization of the greatest ideal regarding conservation—the conservation of human life.

The exposition consists of machines in actual operation, models and photographs of safety devices for circular saws and planers; presses and grinding machines; safety exit doors and fire escapes; respirators and helmets for supplying pure air; elevators, safety lamps, and containers for gasolene and other volatile liquids; textiles, the building trades, transportation, quarrying, the chemical industries and wood-working contain their appropriate safeguards.

New Tools and Shop Appliances

A Dog for Driving Wheel Lathes

This dog is the invention of S. W. Putnam, general superintendent of the Putnam Machine Company, Fitchburg, Mass.

Fig. 1 shows its application to a 90-inch driving-wheel lathe built by the concern. Fig. 2 shows the details of the dog. Each faceplate is, in practice, equipped with a plurality of these dogs and each dog is capable of adjustment radially from the usual centers of the lathe. Each sliding serrated jaw is drawn back along the inclined plane in such a direction as to move the serrated surface toward the faceplate of the lathe, and at the point of maximum movement in this direction a latch is provided for holding jaw in this retracted position. Then, by means of the longitudinal adjustment of the tailstock of the lathe and usual spindles and centers, wheels mounted on their axle are mounted in the lathe, the axle being held in the customary manner on the centers. If the wheels have crank pins projecting from them, these pins are allowed to project into the crank-pin holes or pockets *B*, in the faceplate. It is now that the driving dogs are released by tripping the latch, when the spring exerts its influence to cause the jaw *J* to move along the inclined plane, thereby causing the serrated jaw to gradually approach the tire *I* and until the sliding movement of the jaw is arrested at the point when the serrations of the jaw come in contact with the tire. It is at this point that the well known and commonly employed straps or clamp bars *G*, and bolts *H* are used and by screwing up the nuts on the bolts, the straps or clamp bars pull the rim of the wheel against the serrations or teeth on the dogs to thereby hold the latter in position, and overcome the force of gravity.

ANY and all new or improved machines, tools, or shop appliances of interest to men responsible for results in machinery-making plants will be briefly illustrated and described here—the machine shop news.

A more full and detailed description will be given—when it is real news—if it can appear here first—before it is sent to other papers. All descriptions appear in ALL four editions of the paper—Weekly, Monthly, Weekly English and Weekly German.

The tires are now ready to be turned, it being assumed that the series of dogs on the opposing faceplates of the lathe have been adjusted in the same way.

The tire being set in motion, a resistance offered to the tire by the cut will tend to retard slightly the revolving motion of the tire, and by virtue of the grip previously obtained by the serrated surfaces on the tire the result will be that the serrated jaw will also be retarded directly as is the rim of the wheel, and at the same time the revolving faceplates are not retarded the result will be that the serrated jaw will have a slight movement along the inclined plane and its serrations will be embedded into the tire an amount in proportion to the resistance of the cut and thereby obtain a grip, capable of overcoming the resistance without slipping. The straps or clamp bars and bolts before mentioned furnish the reactive force due to the embedding of the serrated teeth in the tire and prevent the tire iron from unduly springing away from the faceplate. The dogs are also equalizing as well as capable of adjusting themselves automatically to the load, or resistance offered by the cutting tool.

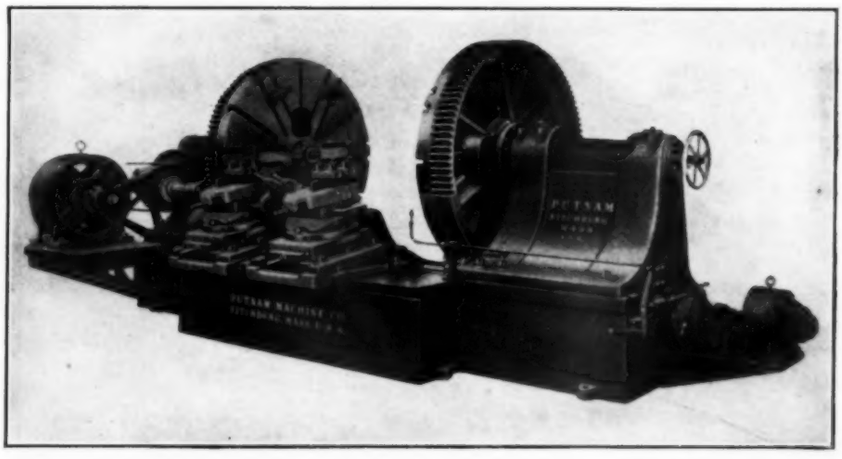


FIG. 1. 90-INCH DRIVING-WHEEL LATHE WITH DRIVING DOGS ON FACEPLATE

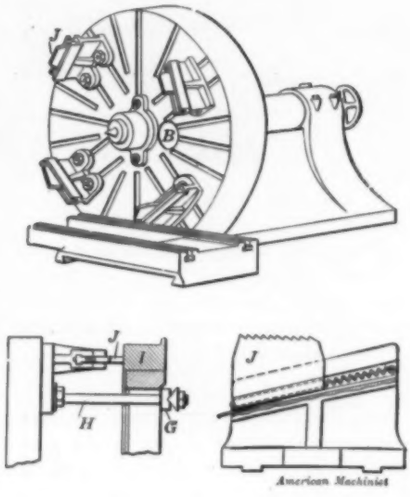


FIG. 2. DETAILS OF THE DRIVING DOG

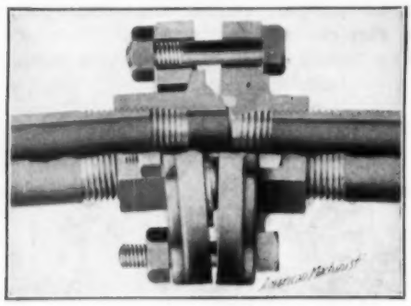
A Small Size Saw Sharpener

The Cochrane-Bly Company, Rochester, N. Y., is making a smaller size grinder for sharpening the saws used on their cutting-off machines. The construction is very similar to that of their regular machine. It has been designed to allow users of small cutting-off machines to secure a grinder at a moderate price, which would sharpen their saws just as well as the larger machine.

The Jefferson Flanged Union

The halftone shows the Jefferson flanged union made by the Jefferson Union Company, Lexington, Mass.

As will be seen the one flange is integral with the threaded part while the other flange is loose upon the threaded member which has a spherical seat fitting the loose flange. The joint where the two threaded members meet is also spherical. With this arrangement the two pipes need not be in line in order to have a perfectly tight joint. This is clearly shown in the halftone.



THE JEFFERSON FLANGED UNION

Tracing Device for Tire Outlines

The tracing device shown in the illustration is used for graphically reproducing the outlines of tires when they are new or have just been turned and for comparing the contour of a tire with the standard outline.

The device consists of a tracing point and a pencil attached to the opposite ends of a rod—which is capable of moving vertically and horizontally in suitable guides—and of a faceplate for holding the sheet of paper on which the outline is drawn by the pencil. The writing sheet is first clamped into position with its edges against the lateral abutments. The vertical limb of the device is then placed against the inner face of the rim and the whole fastened with a thumbscrew, care being taken to make the small elevated stops on the limb bear against the inner surface of the rim.

The pencil, which is kept locked when the device is not in use, is unfastened and the movable portion of the instrument is worked to and fro over the tireface. The path described by the pin gliding over the tire will be accurately reproduced on the sheet by the pencil.

With the aid of a templet of thin sheet metal the standard tire-outline is now drawn against the outline traced by the device. The space between the two outlines will represent the difference, which is to be turned off. With the aid of this tracing device it is easy to make records of the outlines of a tire at various intervals during its life.

TRACING DEVICE FOR TIRE OUTLINES

The machine is being placed on the market by Carl Mahr, Esslingen, a/N Germany.

Hamilton Variable Speed Planer

The importance of variable-speed drive on planers is now recognized, for manifestly there is a serious loss in using the same cutting speed on materials which properly require different speeds, as for instance, steel, cast iron and brass, or in taking roughing and finishing cuts at the same speed.

To meet this requirement, the Hamilton Machine Tool Company, Hamilton, Ohio, has brought out a variable-speed drive which is simple and compact. Fig. 1 shows the planer and Fig. 2 shows the construction of the speed-changing mechanism.

Four different cutting speeds are provided, with a constant quick return speed. The cutting speeds are produced by means of four pairs of gears, operated by one lever, located just back of the driving pulleys (shown in Fig. 1), convenient to the operator. The gears are of steel, engaging by direct contact and not by clutches, a simple construction insuring a positive drive. The change from one speed to another can be quickly made prior to starting, to suit the kind of metal to be machined, and as it is impossible to throw in conflicting gears at the same time, there is no danger of breakage from this source.

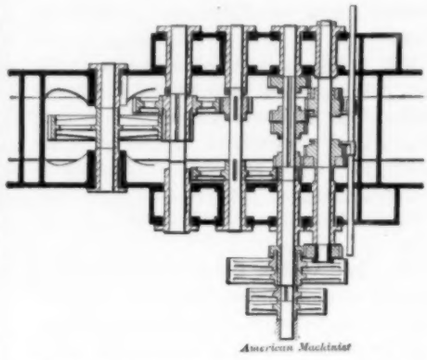


FIG. 2. VARIABLE-SPEED MECHANISM

A rawhide gear transmits the power from the pulley shaft to the first-speed changing shaft, and the speed-changing gears run at comparatively low speed, only two of them being engaged at any one time, affording smoothness of action and preventing unnecessary wear.

The variable-speed drive is located in the bed instead of on the housings, the

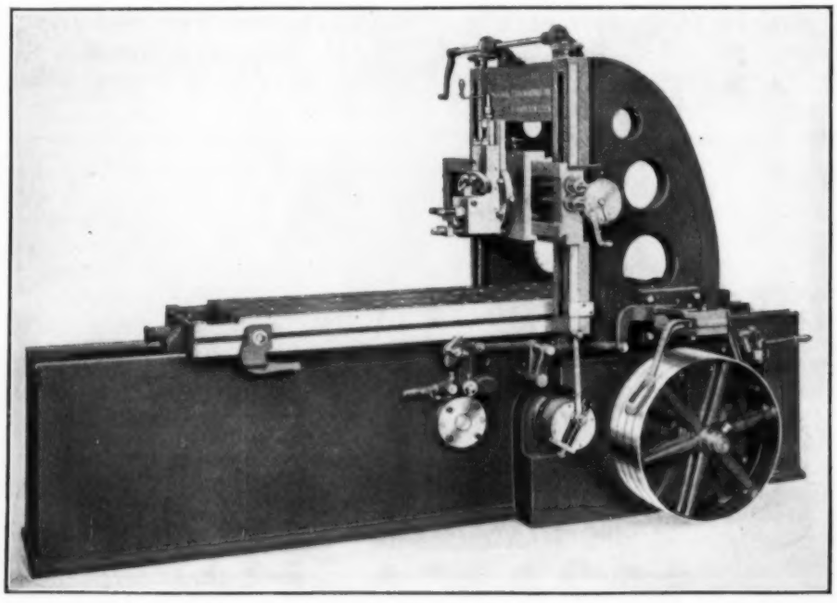


FIG. 1. HAMILTON VARIABLE-SPEED PLANER

gearing is entirely out of the way and thoroughly protected, yet easily accessible at any time.

An index plate, showing the different speeds provided and the proper location of the levers for each speed, is attached to each machine.

Variable-speed drive can be furnished with all sizes of spur-geared planers made by the concern, the machines in other respects being the same as the standard pattern. Motor drive and all usual attachments are also furnished as required.

Squaring Shears with Automatic Feed

The halftone shows a power-driven squaring shears equipped with an automatic feed that will take hold of a sheet of stock and put it in the proper position for successive cuts in splitting the stock into strips of any desired width up to 12 inches. The shears will cut No. 14 gage iron and lighter. The feeding device is better adapted to fairly heavy stock, than to lighter gages.

The machine is back geared and has three different speeds, 46, 60 and 80 strokes per minute, the slower speed being used for the wider strips.

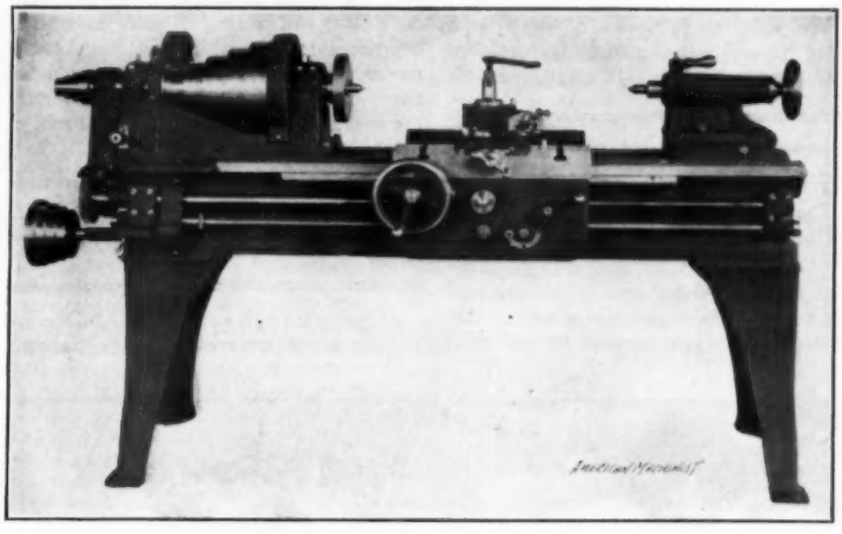
The gripping mechanism is actuated by levers from a crank disk on the main shaft and can be readily adjusted according to the width of the strips to be cut.

The motion of the machine is controlled by a clutch tripped either by foot treadle or by a hand lever.

This shear and automatic feed is made by the Niagara Machine and Tool Works, Buffalo, N. Y.

A 15-inch Engine Lathe

The halftone shows an engine lathe, built by the Rockford Tool Company, Rockford, Ill. The spindle runs in phosphor-bronze bearings, the front one being 2⅝ inches diameter by 4 inches long. It has a 1⅜-inch hole through it. It is furnished with 5 step-cone and single back gears, as shown, or with 3 step-cone and double back gear. The ratio of the single back gear is 10 to 1. Both the cross feed and the compound rest screws are graduated in thousandths. The feed is either by belt or through gears. The change gears are readily placed and removed with the hands only, as a ball catch on stud and lead-screw end renders the use of a wrench unnecessary. The lathe is intended for either tool-room use or manufacturing.

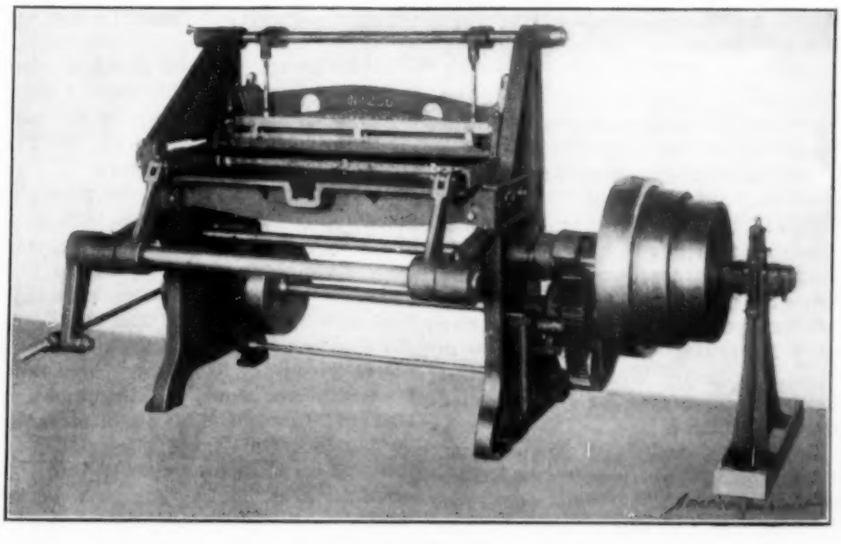


A 15-INCH ENGINE LATHE

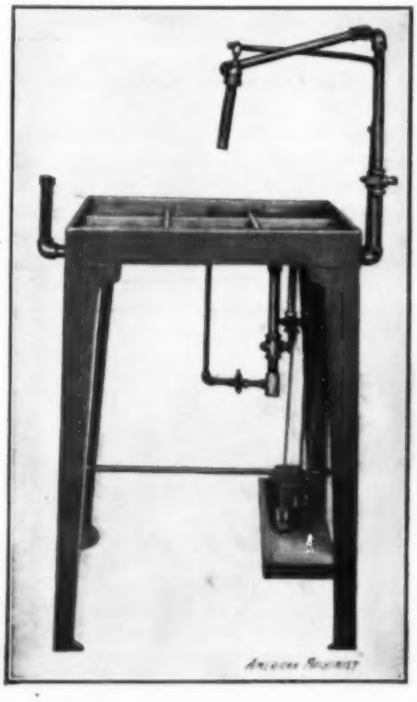
The "Gas Saver" Brazing Forge

J. L. Lucas & Son, Bridgeport, Conn., have brought out the "Gas Saver" brazing forge here illustrated.

The main feature in which this differs from other brazing forges is the treadle. This treadle is hinged from the rear of the forge, and two connecting rods extend to the gas and air valves. The treadle is kept normally raised by a spring connected with the under side of the table. In this position both air and gas valves are opened to the extent that they have been adjusted for, but as soon



SQUARING SHEARS WITH AUTOMATIC FEED



THE "GAS SAVER" BRAZING FORGE

as the operator presses the treadle, both air and gas are shut down to a pilot light. If the operator wishes to leave the machine, the treadle may be swung into the latch near the bottom of the leg near the treadle. Thus, it will be seen that at the numerous intervals between jobs, when adjusting work, charging or doing other work, the gas need not be shut off and time wasted in adjusting the flame again; and it need not be left burning. At such times it is only necessary to press the treadle and swing it into the leg.

The illustration shows a single-torch "Gas Saver," but the forge is furnished with double torches if desired.

Universal Graduating Machine

The machine shown in the halftones is built by the Modern Tool Company, Erie, Penn.

Heretofore 90 per cent. of all graduating work has been done on a milling machine, which is not intended for this class of work. On this machine the work is placed in position, the machine started, and automatically stops when the piece is completed. The No. 1 machine is made for small work such as straight and curved scales, surveying instruments, gun sights, etc., the No. 2 machine is a large machine, with the work end of the base arranged to rotate fixtures or brackets for holding heavy milling-machine saddles, curved scale work, faces or edges of disks, taper dial or drum work.

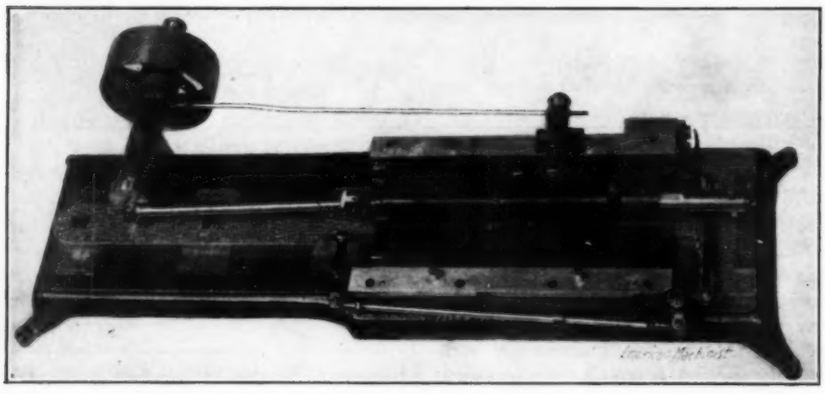


FIG. 1. GRADUATING MACHINE ADAPTED FOR FLAT SURFACES

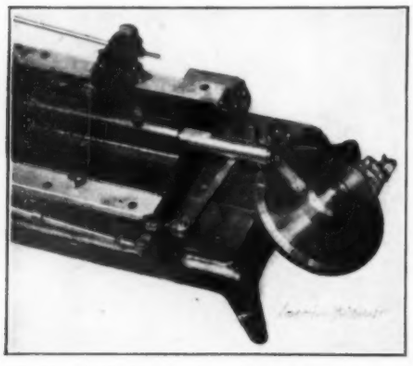


FIG. 2. GRADUATING BEVEL EDGES ON DISKS

Means for accurate adjustments are provided in all parts, and any width of spacing or length of line can be had at will. No work can be spoiled by the machine indexing while the tool is in the work.

The speed of the marking tool will vary somewhat according to the material cut. On soft material such as brass, bronze, german silver, hard fiber, composite, etc., 100 lines per minute can be cut. On steel or other hard material, the speed is limited only by the endurance of the marking-tool point.

Milling Machine Troubles

BY M. E. HOAG

If one will look over the reading matter and advertisements of milling-machine manufacturers, he will no doubt wonder why so few machines are run at anything like the speeds and feeds given by the makers.

An answer to this question will bring out several points that are overlooked in a large majority of shops.

First, the bearings are not kept properly adjusted and lubricated, which allows vibration of the spindle, knee and table.

Second, milling cutters are not properly ground for clearance, or are not ground true with the hole.

Manufacturers of cutter grinders give tables for setting wheels and cutters to obtain the proper clearances, so that about the only reason for poorly ground cutters is laziness.

Third, not one arbor in 25 runs true. If you don't believe it just take an indicator and chase out into your own shop and test your own arbors. In most cases you can stand off 20 feet and see (or hear) them run out.

Now suppose you figure on a feed that will give 0.050 inch per revolution of the spindle at a maximum cutting speed for the material being worked. With a cutter of 16 teeth this would give a little over 0.003 inch for each tooth to remove, and would give a very fine smooth finish on ordinary work; but suppose the arbor is out so that two or three teeth do all the cutting. Those two or three teeth have to remove the entire 0.050 inch of stock and the marks of the cutter will be 0.050 inch apart which will not give smooth work; and the workman will have to cut his feed down to about 0.005 inch in order to obtain anything like the result desired. Then you cuss either the workman or the builder of the machine. As a remedy for some of these troubles I would suggest looking a little closer to adjustments and lubrication. See to it that the grinder hand has the proper wheels, and instructions. Use shorter, heavier arbors with more rigid support and see to it that they are kept true. Use more "face mills" and spiral cutters, and have the belting and countershafts in good condition.

Differential Day Rate Used with the Premium Plan

BY H. A. STAPLES

In setting piece rates the problem of how to increase the operator's output to a point where the piece rate is operative is difficult.

To illustrate: An operator that is producing 5000 units per day, a dissected time study will show, can produce 20,000 units. We will assume the operator's day rate at $2 per day and a piece rate of 15 cents per 1000 units. The earnings at double his initial output, or 10,000 units, would be only $1.50. This would appear to him an outrage and he would quit.

To bridge the gap the premium plan is largely used. While it gives a little increase for a little extra effort it has the unfortunate effect of paying less for the last 1000 units than the first.

To overcome this defect in the premium plans a differential scheme has been used to good advantage in the following manner: In the above instance a rate of 10,000 units per day's work would be set with a differential day rate at 16,000 units. Then for every day that the operator produced 16,000 or more units his hourly rate would be 21½ cents instead of 20 cents, and his premium would be figured on this rate. The amount of increase in the above instance was 1½ cents per hour, but any amount could be used.

It provides a sudden and large increase in pay for reaching a certain goal.

Increasing Shop Capacities

METAL WORKING

NEW ENGLAND

The Seymour (Conn.) Iron Foundry will erect a new plant.

The American Warp Drawing Machine Company, Boston, Mass., will erect a new plant.

The factory of the Prest-o-lite Company, Cambridge, Mass., was badly damaged by fire.

The M. A. N. Manufacturing Company, Providence, R. I., is in the market for new machinery. The company manufactures presses and auto parts.

The main building of the H. D. Smith Manufacturing Company, Southington, Conn., was destroyed by fire, entailing a loss of $150,000. The company manufactures drop forgings.

The Boston (Mass.) Fire Department has plans for a new repair shop to replace the one recently burned. Practically complete equipment of machine tools will be needed.

The Auburn (Me.) Garage Company has been incorporated with $15,000 capital for the purpose of manufacturing, dealing in and repairing automobiles. J. V. S. Darling, president.

The Hart Gas Light Igniter Company, Hartford, Conn., has been incorporated with $25,000 capital to manufacture gas-lighter igniters and automobile specialties. Incorporators, H. T. Hart, E. H. Hyde, G. H. Gilman.

MIDDLE STATES

The James Foundry Company, Clyde, Ohio, will build a new plant.

The Marshall (Mich.) Furnace Company will build a new foundry.

The La Crosse (Wis.) Plow Company is planning to erect a new factory.

The Ohio Brass Company, Barberton, Ohio, is building a two-story addition.

The Ross Motor Company will erect a garage on Tower avenue, Superior, Wis.

The Modern Tool Company, Erie, Penn., is in the market for new machinery.

The Reddin Iron Works, Syracuse, N. Y., will erect a one-story foundry addition.

The M. Rumely Company, La Porte, Ind., is installing equipment in its new foundry.

The plant of the Indiana (Penn.) Hardware Company was burned. Loss, $50,000.

The National Brake & Electric Company, Milwaukee, Wis., will enlarge its brass foundry.

The King Machine Tool Company, Cincinnati, Ohio, is erecting an addition to its machine shop.

The Standard Oil Company is receiving bids for the erection of an oil-can factory in Bayonne, N. J.

Isaac Joseph Iron Company, Cincinnati, Ohio, has had plans made for an addition to its plant on Hunt street.

C. B. Williams, Beloit, Wis., is trying to secure suitable site for a plant for the manufacture of gasolene engines.

J. E. Mergott, manufacturer of metal goods, will build an addition to his large factory on Jeliff avenue, Newark, N. J.

The E. R. Allen Foundry Company, Corning, N. Y., is considering the purchase of machine tools and other equipment.

News items for the sales department—where more equipment will be needed. Authentic news is solicited for this department, not rumors or gossip—facts.

The Great Lakes Engineering Works, Detroit, Mich., is preparing a list of machine tools for shops at Ashtabula, Ohio.

The Baltimore & Ohio Railroad is considering plans for the construction of modern shops, probably at Columbus, Ohio.

It is reported the Warren (Ohio) Board of Trade has made arrangements with a large foundry firm to locate in that city.

The Geo. H. Soffel Company, Pittsburg, Penn., plumbers, will erect a five-story building on Forbes street, near Watson.

Kuhne & Anderton, Beaver Falls, Penn., will establish a plant at Port Hope, Ont., for the manufacture of steel door mats.

The Hoover Manufacturing Company, Avery, Ohio, manufacturing potato diggers, is making extensive improvements at its plant.

The iron-casting plant of the Stanley G. Flagg Company, at Pottstown, Penn., was damaged by fire to the extent of $10,000.

The Belvidere (Ill.) Screw and Machine Company is pushing the erection of its new factory and hope to have it completed soon.

Arthur Colton, with headquarters in the Detroit (Mich.) Gas Company's building, will erect a machine shop on site recently secured.

The Thomas Aërial and Flying Machine Company, Evansville, Ind., has incorporated with $50,000 capital and will erect a plant for the manufacture of flying machines. Incorporators, Herbert B. Thomas, Chas. F. Diefendorf, August Peltz, etc.

The Packard Taxicab and Auto Livery Company, Columbus, Ohio, has been incorporated to operate a taxicab and livery service and run a garage and repair shop. Incorporators, Louis M. Gillespie, Garry L. Stigreaves, Halbert Alexander, etc. Capital, $30,000.

The Gett Manufacturing Company, New York, has been incorporated to manufacture machinery, ball bearings, engines, motor vehicles, etc. Capital, $200,000. Incorporators, L. B. Gleason, F. B. von Teuber, New York; A. G. Schultz, Germany.

The Wasson Piston Ring Company, 96 West Seventh street, Bayonne, N. J., has been incorporated to manufacture piston rings, etc. Capital, $35,000. Incorporators, Foster Crampton, 60 Wall street, New York; Robert B. Wasson, 8 Sylvester street, Cranford, N. J., etc.

The Liberty Manufacturing Company, Dayton, Ohio, has been incorporated with $5000, preliminary capital, to manufacture and sell cutlery and household articles. Incorporators, Charles T. Dumont, Adelbert M. McKay, Marie N. O'Connor, L. Walter Ross and B. Ernest Adams.

SOUTHERN STATES

Charles Wright, Tampa, Fla., will erect a two-story garage.

The Hartsells (Ala.) Machine Company is preparing to erect a new foundry and machine shop.

Gibbes Machinery Company, Columbia, S. C., will expend $10,000 to erect a garage and office building.

The Union Foundry Company, Anniston, Ala., will erect a large addition to its main foundry building.

The Gadsden (Ala.) Car Works is preparing to build additions, including repair shop, machine shop, etc.

The Seaboard Pipe Foundry Company, Savannah, Ga., will erect a new plant to include main shop, machine shop and tapping room, etc.

It is stated that the Chesapeake & Ohio Railway Company is preparing to spend $200,000 in terminal, roundhouse, etc., at Lexington, Ky.

The Georgia School of Technology, Atlanta, Ga., contemplates enlargement of machine shop. State is to appropriate $35,000 and school $15,000.

The Black and Decker Manufacturing Company, Baltimore, Md., has been incorporated for the purpose of engaging in a general machine and manufacturing business. Incorporators, S. Duncan Black, A. G. Decker, Louis Rehberger, Jr.

WEST OF THE MISSISSIPPI

Peter Burlog's blacksmith shop, at Upham, N. D., was burned.

It is understood the "Soo Line" will erect car shops at Ruso, N. D.

H. J. Lawrence will erect a blacksmith shop at Montgomery, Iowa.

The Colby Motor Company, Mason City, Iowa, is erecting a new plant.

Wm. Cummins, of Ortonville, Minn., will erect a blacksmith shop, 25x90.

J. A. & J. Q. Hiatt, Moravia, Iowa, will erect a foundry and machine shop.

W. G. Forsyth, McKinney, Tex., will rebuild machine shops recently burned.

R. A. Collins, Los Angeles, Cal., will erect a blacksmith shop on Tennessee street.

Plans are being made to enlarge Barr Brothers' knife factory at Eugene, Ore.

The Fox-Harris Machine and Supply Company, Pine Bluff, Ark., is erecting a new building.

The Zenith Furnace Company, of Duluth, Minn., will erect another furnace to cost $225,000.

The Anaheim (Cal.) Sugar Company has let contract for the erection of building, to include machine shop.

The Eureka Manufacturing Company, Newcastle, Ind., making tables, etc., is seeking site for a new plant.

Pealer & Ingram, Garden Grove, Cal., will erect a commercial garage. Modern repair machinery will be installed.

The Field Auto Company, of Lincoln, Neb., will build a two-story factory, 50x150, at Twenty-sixth and Randolph streets.

Plans are being prepared for a foundry and machine shop in which Philip Thierolf and T. H. Pollock, of Plattsmouth, Neb., are interested.

The Dodd Steel and Iron Works Company, Des Moines, Iowa, is looking for a suitable location for the erection of modern bridge and iron works.

The Los Angeles (Cal.) Railway Company, which has taken over the Pacific Electric System in the city limits, will make improvements, including new shops, etc.

The Jas. A. Moore Corporation, at Irondale, Wash., will erect two additional open-hearth furnaces, a rolling mill, a tube mill, a sheet mill and tin plant, to cost about $10,000,000.

CANADA

The Amherst (N. S.) Malleable Company is erecting an addition.

The Sutherland Fence Company, Sarnia, Ont., is erecting a new factory in which wooven wire will be manufactured.

Lincoln Chandler, of Vancouver, is the head of a firm which intends spending $5,000,000 on large engineering works there.

The Ottawa Furnace Manufacturing Company will build a factory in Calgary, Alberta, for the manufacture of furnaces, ranges, etc.

A large foundry will be erected at Port Arthur to manufacture cast-iron pipes and car wheels. This is in conjunction with the Atikokan blast furnace. Five hundred thousand dollars will be expended in the project and as this will make a very much larger demand for the pig iron of the present plant, which is of 200 tons capacity and 100 coke ovens, the extension of the blast furnace is already under serious consideration.

FOREIGN

The American Agency, Kleine Sandstrasse 7/9, Riga, Russia, would like to receive catalogs and quotations on nail-making machinery.

General Manufacturing

NEW ENGLAND

The Rossie Velvet Company is to erect a new plant at Willimantic, Conn.

Griswold & Bryant, Randolph, Vt., are in the market for laundry machinery.

The Bradford Textile School, Fall River, Mass., is to install new machinery.

The town of Webster, Mass., is to install a new water system to cost $30,000.

The Windham Silk Company, Willimantic, Conn., is having a three-story addition built.

The Reliance Worsted Company, Norwich, Conn., will start a branch mill at Olneyville, R. I.

The Griffin Button Company, of Shelton, Conn., plant badly damaged by fire. Loss, $20,000.

The Rhode Island Company, Providence, R. I., is in the market for conveying machinery.

The factory of the Orleans Bobbin Company, Newport, Vt., was destroyed by fire. Loss, $10,000.

Fire destroyed the Brunswick Knitting Mills, Brunswick, Me. Loss, $11,000. Will be rebuilt.

The blacking and dressing plant of the Whittemore-Woodbury Company, Charlestown, Mass., was damaged by fire.

John F. Hunt, 12 Columbia avenue, East Lynn, is in the market for four 3-phase, 60-cycle motors, five to 20 horsepower.

Hotel Taft, New Haven, Conn., is in the market for steam and vacuum pumps and steam separators.

The Francis P. Arnold shoe factory, Pembroke, Mass., was destroyed by fire. Loss, $5000. Will rebuild.

Sydney, Blumenthal & Co., Inc., Shelton, Conn., are to have a new four-story woolen mill erected.

The Southbridge Optical Company, Southbridge, Mass., is to remove its plant to Montreal, Canada.

The plant of the Springfield Photo Engraving Company, Springfield, Mass., was badly damaged by fire.

The Rome-Ferguson Company will erect a plant in Worcester, Mass., for the manufacture of heavy woolens.

The Wm. Whitman Mills, at South Lawrence, Mass., are nearly completed. New machinery will be installed.

The Lafayette Worsted Company, Woonsocket, R. I., will install ventilating and humidifying apparatus.

The Glen Worsted Company, at Harrisville, R. I., is to remove its plant to the new Tinkham mills in the same place.

Eugene S. Graves and Abbot P. Smith are interested in a new cotton-finishing plant to be erected in New Bedford, Mass.

The York Manufacturing Company has purchased 1000 acres of land at Old Orchard, Me., and will erect several cotton mills.

The Glen Worsted Mill Company, of Harrisville, R. I., has leased property at Elmville, Conn., and will start manufacturing there.

The Exeter, Hampton & Amesbury Street Railroad, Hampton, N. H., is in the market for a 1000 G. P. M. electrically driven centrifugal fire pump.

The Grand Lodge of Massachusetts, will establish Masonic Home at Charlton, Mass., and will install laundry, steam-heating and electric-light plant.

The H. D. Hayward Weaving Mills, Franklin, Mass., is building an addition. Contemplate further additions and new power house to be equipped with steam turbines in the spring.

MIDDLE STATES

Schlesingerville, Wis., is in the market for new machinery.

The Woolson Spice Company, Toledo, Ohio, will erect a five-story factory.

The Hibert carriage factory, at Warrenton, La., was burned. Loss, $25,000.

The Globe Elevator Company, Buffalo, N. Y., has plans for a new grain elevator.

The B. & B. Buggy Company, Marshall, Mich., has plans for a new plant.

The C. W. Kotsher Lumber Company, Detroit, Mich., will erect a planing mill.

The Mentor (Ohio) Knitting Mills Company is planning to double its capacity.

The Wilmington (Del.) Gas Company has secured a permit to erect a boiler house.

The Cincinnati (Ohio) Traction Company is making an addition to its boiler house.

The Hunter & Lore Lumber Company is building a sawmill at Soo Junction, Mich.

The Wilkes-Barre (Penn.) Milling Company is building an extensive addition to its plant.

The Escanaba Lumber Company, of Masonville, Mich., will build a sawmill at Masonville.

The mills of the International Pulp Company, at Hyatt, N. Y., were burned. Loss, $100,000.

The Green Engineering Company, East Chicago, Ind., is in the market for a yard traveling crane.

The Thisson Silk Fabric Company, Fonda, N. Y., is thinking of locating a factory at Bristol, N. Y.

The Duplan Silk Mill, at Hazleton, Penn., expect to enlarge plant. They now employ 1000 hands.

Ingram & Richardson, Beaver Falls, Penn., enamel-sign manufacturers, are erecting additional building.

The Troy (Ohio) Wagon Works is having plans drawn for a one-story building. A paint shop is also planned.

The Cleveland & Sandusky Brewing Company, Cleveland, Ohio, will build a two-story addition to its bottling works.

The Ohio Valley Scenic Railway Company, East Liverpool, Ohio, will install a hot-water heating system for cars.

The American Biograph Company, of New York, will erect a plant at Pico and Georgia streets, Los Angeles, Cal.

The Norton Machinery Company, Cincinnati, Ohio, is in the market for a 150-horsepower tandem Corliss engine.

The Chalmers Motor Company, Detroit, Mich., will erect a one-story boiler house at Jefferson avenue and New Belt Line.

The John Strootman Shoe Company has filed plans for a $40,000 factory to be erected at 588 Monroe street, Buffalo, N. Y.

The Monarch Underwear Company, Bowling Green, Ohio, contemplates erecting a new addition and installing more equipment.

The American Colortype Company will erect a large factory at the corner of Summer avenue and Halleck street, Newark, N. J.

The Wisconsin Land and Lumber Company's sawmill was burned at Hermansville, Mich. Loss, $100,000. Will be rebuilt at once.

The Smith-Phillips China Company, East Liverpool, Ohio, is contemplating the erection of an electric kiln for domestic pottery firing.

Blanchard Brothers & Land, leather manufacturers, are building an addition to their present plant at Bruen street, Newark, N. J.

The engine house and boiler room of the No. 1 mine, Blair Big Muddy Coal Company, at Murphysboro, Ill., was destroyed by fire.

The Hargreaves Manufacturing Company, Detroit, Mich., manufacturer of picture frames, moldings, etc., will erect a three-story addition.

The H. C. Fry Glass Company, Rochester, Penn., is planning to enlarge its factory in order to increase the production of automobile lamp lens.

The Fruit Growers Refrigerating and Power Company, Anna, Ill., is contemplating the installation of a large rock-crushing plant and steam shovel.

The Hardwood Products Company, Neenah, Wis., has commenced the erection of a $400,000 plant for the manufacture of interior hardwood furnishings.

The Geneva (N. Y.) Glass Works has acquired additional land for increasing the capacity of its plant. It will erect new buildings, which will triple its present output.

The Wood Novelty Company, Harrod, Ohio, has been incorporated to manufacture lumber and wooden novelties, by Alvin E. Rankin, Levi B. Miller, Charles W. Johnston, etc.

A. A. Heller, of New York City, representing the International Oxygen Company, of Paris, will erect a factory on Frelinghuysen avenue, north of Evergreen avenue, Newark, N. J.

The Caledonia Marl Company, Caledonia, N. Y., branch of the International Agricultural Corporation, will erect additional buildings for the handling of potash and lime fertilizer.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will receive bids November 29, for two generator sets for the Newport, R. I., navy yard, as per Schedule 3051.

The Alliance Manufacturing Company, of Streator, Ill., is contemplating the erection

of a plant at Toledo, Ohio, for the manufacture of wagons for ice-cream cone and popcorn peddlers.

The Kilbourne Mutual Telephone Company, of Kilbourne, Ohio, was incorporated to build and operate a telephone exchange by Charles F. Rodenfels, Claude S. VanSickle, Charles W. Humes, etc.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids December 6, for one Scotch boiler (schedule 3091), one locomotive wrecking crane (schedule 3072).

The Whiteacre Fireproofing Company, Canton, Ohio, has purchased property of the Pittsburg-Malvern Clay Company at Malvern, Ohio. Additional machinery will be installed and several kilns added.

The Frontier Rubber Company, Buffalo, N. Y., has been incorporated to manufacture pneumatic and hard tires. Capital, $10,000. Incorporators, Chas. F. Benging, John G. Stowe, Chas. A. Castor.

The Peerless Standard Paper and Woodenware Company, New York, has been incorporated for the manufacture of paper bags, twine, woodenware. Capital, $35,000. Incorporators, H. Reiss, M. Myerson, G. Studly, etc.

The Continental Fiber Company, Cincinnati, Ohio, has been incorporated with $50,000 to manufacture and sell all kinds of fiber goods. Dwight F. Jeraud, Vergil G. Collis, William W. Rowland, and others, are incorporators.

The Pierce Player and Action Company, Cleveland, Ohio, has been incorporated to manufacture and sell piano players and other automatic arrangements. Incorporators, Walter G. Pierce, William H. Mallott, M. Jenkins and others. Capital, $75,000.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids November 29, for 8000 paint cans, wire cloth, wood screws, cast-steel crucible wire (schedule 3087), cutters, twist drills, reamers, taps and dies (schedule 3082).

The Butler Cabinet Company, Butler, Ohio, has been incorporated with $50,000 to manufacture and sell cabinets, interior finishings and furnishings and general wooden articles. P. Phipps, J. R. Stannton, D. A. Spayde, R. S. Hubbs and J. H. Downing are incorporators.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will receive the following bids: November 22—Brass grommets, hardware, steel tape measures, steel wire nails, brass machine screws, brass wood screws, taps and dies, hand tools (schedule 3062), 30,000 pounds medium bar steel, 25,000 pounds galvanized sheet steel (schedule 3061).

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids December 6, for 3850 pounds steel bolts and nuts, files, saws and saw blades, taps and dies, hand tools (schedule 3068), 6355 pounds brass rod, 7730 pounds sheet brass (schedule 3069), 93,500 pounds medium bar steel, 15,200 pounds round naval bronze, 15,000 sheet zinc (schedule 3067).

SOUTHERN STATES

The Davis Hosiery Mills, Chattanooga, Tenn., will build a two-story addition.

The city of Camp Hill, Ala., voted to issue $17,000 bonds for an electric-light plant.

The Riverside Sanitary Pottery Company, Wheeling, W. Va., will erect five additional kilns.

The High Point, N. C., hosiery mills will install new machinery and later increase its dyeing and finishing plants.

The Washington Woolen Mills Company, Fredericksburg, Va., has awarded contract for the erection of a two-story building.

City of Timmonsville, S. C., will receive bids until December 7, for furnishing and constructing waterworks. J. N. Johnson, Florence, S. C., engineer.

The waterworks department, of Lakeland, Fla., is in the market for a 175-k.v.a., 2300-volt, 60-cycle, three-phase generator, to be direct connected to an automatic compound engine.

Proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until 11 a.m., December 3, for two 300-horsepower boilers, piping, economizer, flue, boiler-feed pumps, motor-generator set, wiring, etc., at the United States naval station, New Orleans, La. Plans and specifications can be obtained on application to the bureau or to the commandant of the navy yard named. R. C. Hollyday, chief of bureau.

WEST OF THE MISSISSIPPI

City of Munday, Tex., voted $10,000 bonds for waterworks.

An electric-light system will be installed at Glidden, Iowa.

The city of Madera, Cal., will install a municipal water system.

The Burlington road will erect a coach shop at Havelock, Neb.

The city of Holtville, Cal., will install a municipal water system.

The Monticello (Iowa) Electric Company is preparing to erect a gas plant.

The Chino Farm Dairy Company, Pomona, Cal., is building an addition to its plant.

The Imperial Valley Oil and Cotton Company, El Centro, Cal., is erecting an oil mill.

The Diamond Basket Company, Little Rock, Ark., will rebuild its plant recently burned.

The M. E. Smith Shirt Company, of Nebraska City, Neb., will erect a shirt factory.

The engine house of the C. M. & St. Paul, 60x100, at Coon Rapids, Iowa, was burned.

Steam-heating equipment will be required in the remodeled Hotel Johnson, Los Angeles, Cal.

McGill & Adams, Ely, Nev., will build a packing house and cold-storage plant at Reno, Nev.

A. Gregory, Cucamonga, Cal., has let the contract for the erection of a new packing house.

J. E. Winship, Arlington, Cal., is building a planing mill on Magnolia avenue, Riverside, Cal.

The Des Moines (Iowa) Ice and Cold Storage Company will expend $70,000 in improvements.

William Burnett, of Hankinson, N. D., will establish a cement-block factory at Lidgerwood, N. D.

The Lee Broom and Duster Company will erect a plant at Twenty First and Y streets, Lincoln, Neb.

The city of Centralia, Wash., will erect a municipal lighting plant and is in the market for equipment.

The Alder Creek Mining Company will build a 200-ton cyanide mill on Yellow Creek, Deadwood, S. D.

The St. Paul Bread Company will erect a $150,000 plant at Minnesota and Twelfth streets, St. Paul, Minn.

The grain elevator of the Nye-Schneider-Fowler Company, Omaha, Neb., burned some time ago, is to be rebuilt.

The roller mill and electric-light plant, owned by the Salem (S. D.) Light Company, were burned. Loss, $18,000.

The Pacific Gas and Electric Company, Colusa, Cal., will make improvements in its plant and its electric system.

A new hydraulic elevator system will be installed in the remodeled San Fernando building, at Los Angeles, Cal.

The North American Brick, Tile and Pottery Company is erecting a plant at Walsh, Minn., which will employ nearly 500 men.

L. F. Cummings, of Austin, Minn., will erect a two-story bottling works, 28x110, at Fifth and Main streets, Mason City, Iowa.

The Madary Supply House, Los Angeles, Cal., manufacturers of bee-keepers' supplies, is planning to install new manufacturing machinery.

The New Consolidated Gas Company, Long Beach, Cal., a combination of the Inner Harbor and Edison Company, will erect a new gas plant.

Steam-heating equipment will be required in the new addition to the Los Angeles County Hospital. Hudson & Munsell, architects, Los Angeles, Cal.

The Desert Power and Water Company, Central building, Los Angeles, Cal., is building a large addition to its power plant at Kingman, Ariz.

The Southern California Edison Company is now taking bids for the erection of the superstructure for its new power plant at Long Beach, Cal.

A forced-blast heating system will be installed in the new Congregational Church, Corona, Cal. Norman F. Marsh, architect, Los Angeles, Cal.

The Citizens' Water Company, San Jacinto, Cal., is planning extensive improvements in the system, including pumping plants and sinking of new wells.

A new cyanide plant will be installed in the Reward & Brown Monster Mines, Inyo county, Cal., by the owners. A. J. McCone and associates, Reno, Nev.

The St. Paul Tannery Company, of South St. Paul, Minn., has plans for the erection of a new plant. Power plant to be increased from 125 to 500 horsepower.

A large refrigerating plant will be installed at the restaurant, Casa Verdugo, Glendale, by the owners, the Pacific Electric Railway Company, Los Angeles, Cal.

Heating equipment will be required in the new auditorium building for the St. Mark's Church, Los Angeles, Cal. H. M. Patterson, architect, Los Angeles, Cal.

Power-plant equipment will be required in the new 10-story office building (Security building) to be erected at Eleventh street and Broadway, San Francisco, Cal.

An oil refinery will be built at Long Beach, Cal. C. J. Curtis, manager of the Los Angeles Dock and Terminal Company, Long Beach, Cal., is at the head of the enterprise.

A septic sewer system and water system will be installed in the new 40-acre tract at San Fernando, Cal., by the owners, the Independent Order of Foresters, Los Angeles, Cal.

Beecher Ward, and others, of Fairmont, Minn., have acquired 70 acres of tile clay, north of Glenville, Minn., and have organized a $250,000 company and will erect a modern tile factory.

D. W. Howarth and J. C. Marquadt, San Diego, Cal., contemplate the erection of a cotton mill at San Diego, for the manufacture of Imperial cotton into staple products. The plant will cost $300,000.

The Anaheim Sugar Company has let the contract for the first building of its new sugar factory at Anaheim, Cal. There will be two buildings, one the factory, the other containing a boiler house, machine shop, lime kiln, etc.

The city of Alhambra, Cal., will receive bids up to November 26 for four 6-horsepower horizontal gas engines of standard make, four

2¾-kilowatt generator, alternating current, together with pulleys, belting, etc. Peter T. Anderson, city clerk.

The Independent Electric Company, Salem, Ore., has arranged for the purchase of the Haines Light and Power Company and the Hillsboro Water, Light and Power Company. The new company contemplate extensive improvements throughout the systems.

The recently reincorporated Los Angeles Railway Company has taken over the Pacific Electric system in the city limits. The company operates over 350 miles. The entire plants of the company will be augmented, car houses and shops built, new substations erected, etc.

Proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until 11 a.m., December 3, for furnishing and installing at the naval coal depot, Tiburon, Cal., two boilers, one boiler-feed pump, motor-generator set, transformer, switchboard, etc. R. C. Holllyday, chief of bureau.

CANADA

The Capital Flour Mills, at Regina, will be doubled.

Nanton, Alberta, will buy full electric-light equipment.

Winnipeg will spend $650,000 on new pumping stations.

The Bold Glass Company will locate a factory at Toronto.

James Drummond will build a large factory at Victoria, B. C.

Moncton, N. B., will build a new waterworks pumping station.

E. F. Wayman will equip a $40,000 soap factory at Edmonton, Alberta.

The John Martin Paper Company will build a big factory at Winnipeg.

The Hamilton Mirror Plate Company, of Hamilton, is extending its plant.

Fire destroyed the power house of the Renfrew (Ont.) Electric Company.

The New Michel Sawmill Company will build a $50,000 mill at Michel, B. C.

Rouleau, Saskatchewan, will buy $45,000 worth of new waterworks equipment.

L. B. Lincoln, of Montreal, is building a large peat-producing plant at Winnipeg.

Edmonton, Alberta, will spend $500,000 for new waterworks and pumping machinery.

The Imperial Electric Company will erect a large branch factory at Windsor, Ont.

The North American Furniture Company is building a large factory at Owen Sound, Ont.

Thompson Brothers will build a large new shoe factory at Portage La Prarie, Manitoba.

The Canadian Cooperage Company will build a large new factory at Smith Falls, Ont.

Winnipeg, Manitoba, will buy 305,000 pounds of copper wire for power distribution.

Englehart, Ont., will issue $30,000 bonds for the construction of a hydroelectric power plant.

The Colonial Wood Products Company, Thorold, Ont., is building an addition to its plant.

The South Bruce Telephone Company, of Belmore, Ont., is in the market for equipment.

The pumping station at Weston, Ont., will be greatly enlarged and new machinery installed.

The carriage factory of S. Fillmore, Southampton, N. S., was destroyed by fire. Loss, $35,000.

The Winnipeg (Man.) Ceiling and Roofing Company will erect a new plant to cost $59,000.

The flour mills of H. Bracken & Son, Boston Mills, Ont., was destroyed by fire. Loss, $15,000.

The Birtle Electric Power and Manufacturing Company will build a factory at Birtle, Manitoba.

The Garlock Packing Company, manufacturers of engine packing, is doubling its plant at Hamilton.

Englehart, Ont., will buy $30,000 worth of machinery for generating electricity from water power.

The factory of the Charles Diebel Furniture Company, at Hanover, Ont., destroyed by fire, will be rebuilt.

The Penticton Lumber Company will spend $200,000 for equipment for a large mill at Penticton, B. C.

Fire destroyed the main building of the Ontario Wheel Company, at Gannonoque, Ont. Loss, $175,000.

The Empire Company, of Crofton, B. C., will spend $1,000,000 equipping the largest sawmills in British Columbia.

The Alberta Electric Railway Company, with head office at Medicine Hat, is in the market for large quantities of equipment.

The B. F. Nelson Company, of Minneapolis, will build a large branch factory in Winnipeg to manufacture roofing and building papers.

The Manitoba Bridge and Iron Works, Winnipeg, Man., is in the market for a belt driven compound air compressor of 700 cubic feet capacity.

The plant of the Victoria Book and Stationery Company, at Victoria, B. C., destroyed completely in the recent big fire, will be reëquipped immediately. Loss, $100,000.

Business Items

It has been officially announced that the Horton chucks, as made by the E. Horton & Son Company, Windsor Locks, Conn., have been awarded a gold medal at the Brussels Universal and International Exposition, 1910.

The Cincinnati Chuck Company, of Cincinnati, which was organized about two years ago to manufacture a line of chucks, has sold its business, including the equipment, to the Union Manufacturing Company, of New Britain, Conn.

An exhibit of foundry facings, supplies and equipment, was held at the Chicago plant of the S. Obermayer Company, on October 26. Large show rooms were fitted up for the display of supplies and equipment used by foundrymen, which were visited by over 400 people.

Howard L. Washburn recently disposed of his interests in the firm of Bickford & Washburn, Inc., Greenfield, Mass., and at a stockholders' meeting held November 5, Mr. Washburn's resignation as secretary and one of the directors was accepted, his place filled, and the firm name changed to Bickford Machine Company, the list of officers now standing as follows: President and treasurer, O. S. Bickford; secretary, L. B. Weissbrod; superintendent, Wm. H. Russell.

Trade Catalogs

Hendey Machine Company, Torrington, Conn. Catalog. Milling machines. Illustrated, 96 pages, 6x9 inches, paper.

Sebastian Lathe Company, Cincinnati, Ohio. Catalog No. 14. Engine and speed lathes. Illustrated, 36 pages, 6x9 inches, paper.

The R. K. LeBlond Machine Tool Company, Cincinnati, Ohio. Catalog. Cutter grinders. Illustrated, 70 pages, 6x9 inches, paper.

Wells Brothers Company, Greenfield, Mass. Catalog No. 28. Bolt cutters, nut tappers and pipe threaders. Illustrated, 52 pages, 5x7 inches, paper.

Modern Tool Company, Erie, Penn. Catalog. Grinding machines, die chaser grinder, self-opening and adjustable screw cutting die heads, tap and die holders, chucks, etc. Illustrated, 80 pages, 6x9 inches, paper.

Forthcoming Meetings

National Society for Promotion of Industrial Education, fourth annual convention, Boston, Mass., November 17, 18 and 19.

American Society of Mechanical Engineers, annual meeting, December 6-9, New York. Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York City.

American Foundrymen's Association, annual convention, Pittsburg, Penn., May 23 to 26, 1911. Richard Moldenke, secretary, Watchung, N. J.

American Society of Mechanical Engineers; monthly meeting second Tuesday. Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York City.

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month, Young's hotel. D. F. S. Clark, secretary, 141 Milk street, Boston, Mass.

Providence Association of Mechanical Engineers. Monthly meeting fourth Tuesday each month. E. C. Bliss, president, 91 Sabine street, Providence, R. I.

New England Foundrymen's Association; regular meeting second Wednesday of each month, Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Engineers' Society of Western Pennsylvania; monthly meeting third Tuesday. Elmer K. Hiles, secretary, Fulton building, Pittsburg, Penn.

Superintendents' and Foremen's Club of Cleveland; monthly meeting third Saturday. Philip Frankel, secretary, 310 New England building, Cleveland, O.

Western Society of Engineers, Chicago, Ill. Regular meeting first Wednesday evening of each month, excepting July and August. Secretary, J. H. Warder, 1735 Monadnock block, Chicago, Ill.

Philadelphia Foundrymen's Association; meetings first Wednesday of each month, Manufacturers Club, Philadelphia, Penn. Howard Evans, secretary, Pier 45 North, Philadelphia, Penn.

WANTS

Rate 25 cents per line for each insertion. About six words make a line. No advertisements abbreviated. Copy should be sent to reach us not later than Friday for ensuing week's issue. Answers addressed to our care, 505 Pearl street, New York, will be forwarded. Applicants may specify names to which their replies are not to be forwarded, but replies will not be returned. If not forwarded, they will be destroyed without notice. No information given by us regarding any advertiser using box number. Original letters of recommendations or other papers of value should not be inclosed to unknown correspondents. Only bona-fide advertisements inserted under this heading. No advertising accepted from any agency, association or individual charging a fee for "registration," or a commission on wages of successful applicants for situations.

Miscellaneous Wants

Caliper catalog free. E.G.Smith, Columbia, Pa.

B. Jahn, New Britain, Conn., makes dies, tools, models and specialties.

Special machinery and tools designed and detailed. Box 146, AMERICAN MACHINIST.

Wanted—To lease small machine shop with right to purchase in year. Box 169, AM. MA.

We buy or pay royalty for good patented machine or tool. Box 282, AMER. MACHINIST.

The "Gas Saver" brazing forge; circular. J. L. Lucas & Son, 2 Fox St., Bridgeport, Ct.

Wanted—Work for screw machines and gear cutter. Box 775, AMERICAN MACHINIST.

Light, fine machinery to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Tool designing, mechanical and electrical drawings. Berkshire Engineering Co., Pittsfield, Mass.

Light and medium weight machinery and duplicate parts built to order; tools, jigs, etc. MacCordy Mfg. Co., Amsterdam, N. Y.

Patents. C. L. Parker, Patent Attorney, ex-examiner Patent Office, 950 G St., Washington, D. C. Write for Inventor's Handbook.

Wanted—Spur gear cutter to take 8-foot gears; state condition fully and where can be seen. Dillon-Box Iron Works Co., Denver, Colo.

Wanted—To negotiate with manufacturing plant equipped for economically manufacturing high grade developed vertical high speed steam engines, weighing three tons to fifty tons. "Engine," AMERICAN MACHINIST.

Large English firm of machine tool importers having showrooms and offices in Great Britain, France, Germany, Italy, India and Japan is wanting good agencies for machine tools of all kinds. Box 189, AMER. MACH.

The Edmunds & Jones Manufacturing Company, of Detroit, Mich., manufacturers of automobile lamps, will be pleased to receive catalogs from manufacturers of sheet metal machinery, plating, electro-galvanizing and enameling processes and electric lamp accessory devices.

Mechanical engineer, owning designs of gas producers and gas engines, which are being built in sizes from 15 to 150 horsepower, wishes to organize a company; about $30,000 worth of apparatus ready for shipment and in course of construction. Box 176, AMERICAN MACHINIST.

HELP WANTED

Classification indicates present address of advertiser, nothing else.

CANADA

Three good diemakers, experienced on sectional dies for large electrical machinery work. Apply Allis-Chalmers-Bullock, Limited, Montreal, Que., Canada.

INDIANA

Superintendent, to take complete charge of a plant employing 400 men and manufacturing a varied line of special machinery; must have experience in machine shop, sheet metal, pattern and foundry work; a splendid opportunity for a high grade, uptodate man, having executive ability; state fully experience and age in first letter Box 173, AMER. MACH.

MASSACHUSETTS

Head draftsman and designer, experienced on rotary printing presses and folders. Box 132, AMERICAN MACHINIST.

Wanted—First class draftsman; should be up to date on lathe and milling machine design. Box 157, AMERICAN MACHINIST.

Experienced salesman wanted to travel from Boston to Chicago selling an extensively advertised and popular machine tool; state salary desired and past experience in selling. Box 109, AMERICAN MACHINIST.

Foreman wanted for machine shop in the manufacture of marine machinery; must be capable of handling men to advantage; permanent job to the right party. Write confidentially, with copies of references, to D. F. S. Clark, 141 Milk St., Boston.

MICHIGAN

Wanted—Experienced foreman for planer department; excellent opportunity for man qualified to increase production of high class machine work; ideal shop conditions. Grant & Wood Mfg. Co., Chelsea, Mich.

Wanted—First class toolmaker who has had experience in making tools for trunk and suit case locks and hardware; also press room foreman, who understands setting up tools and running presses. Box 160, AM. MACH.

MINNESOTA

Wanted—First class mechanic as foreman of machine tool department; must have had previous experience in charge and furnish references, who will testify to your ability to handle men and secure results; a splendid opportunity for the right man. Box 178, AMERICAN MACHINIST.

NEW YORK

Boiler fuel economy; agent required in the United States for the sale of scientific instrument selling freely and in successful operation in Europe and British Colonies; price each, about $200. Box 175, AMER. MACH.

Wanted—An experienced man familiar with estimating on foundry and machine work, in a shop doing a general jobbing business, in the vicinity of New York City. Address, stating experience and salary expected. Box 171, AMERICAN MACHINIST.

Young man with technical or practical mechanical knowledge of general tool room work, who also is able to write articles and assist in preparing advertising copy for trade papers; splendid opportunity for the right man. "F. D. B.," AMERICAN MACHINIST.

OHIO

Wanted—First-class machinists, toolmakers, die sinkers, lathe, planer, drill press, screw machine, boring and milling machine operators, wood patternmakers, brass molders, polishers, buffers, finishers, spinners, millwrights, hammermen and blacksmiths who are seeking positions or desirous of improving on those which they have, to register their names and addresses with the free Employment Department of the National Metal Trades Association. Address Commissioner's Office, 605 New England Bldg., Cleveland, O.

PENNSYLVANIA

Correspondence solicited with competent all-around drop die maker for light steel forgings; give experience, age, references and wages. Box 165, AMERICAN MACHINIST.

Machinist Foreman—A first class man as night foreman in machine shop located in small town in eastern Pennsylvania; one having knowledge of flanged steam fittings and similar work preferred; must be thoroughly reliable and capable of handling men; state experience and full particulars. Address by letter, Irvin Bair, 116 N. Broad St., Philadelphia, Penn.

The Monotype School is maintained to train young men to meet the constant demand for operators of our type casting and composing machine; these operators do so well that we receive more applications for places than can be filled; these qualifications carry most weight: Common sense, automatic machinery experience, printing office experience, type foundry experience. Full particulars will be furnished to inquirers who furnish the same information about themselves, and mention this paper. Lanston Monotype Machine Co., Philadelphia.

WISCONSIN

Expert tool designer, having shop experience as well as technical training in pressed steel work to take charge of tool drafting room for large stamping plant in Milwaukee; unusual opportunity for an ambitious and capable man; state salary and past experience. Box 166, AMERICAN MACHINIST.

SITUATIONS WANTED

Classification indicates present address of advertiser, nothing else.

ALABAMA

Sales engineer, with technical education, desires to represent prominent northern manufacturer in the South. Box 167, AM. MACH.

CALIFORNIA

In West, Middle or Southwest, position requiring a high grade man with brains, initiative, ability and experience; salary secondary consideration; engineering, mining or manufacturing. Box 159, AMERICAN MACHINIST.

CONNECTICUT

Mechanical engineer, 15 years' experience, open for position anywhere. "Resourceful," AMERICAN MACHINIST.

Designing draftsman, automatic machinery, tools, dies, jigs and fixtures; power and plant work and mill architecture. "Immediate," AMERICAN MACHINIST.

An A-1 tool room foreman; excellent reputation; expert on tool and die work; thoroughly experienced in manufacturing by uptodate methods and installing labor saving devices. Box 181, AMERICAN MACHINIST.

DELAWARE

Position as assistant manager or superintendent in manufacturing company; age 32; technical graduate; broad experience in uptodate methods, factory management, precision machinery, sales and advertising; excellent references. Box 179, AMERICAN MACHINIST.

MASSACHUSETTS

Assistant superintendent or general foreman; A-1 tool and machine designer; can get maximum output from equipment; age 34. Box 174, AMERICAN MACHINIST.

Superintendent; age 38; first class executive and highly successful manager of men; practical mechanic; now employed; highest references. Box 125, AMERICAN MACHINIST.

NEW JERSEY

Wanted—First class gas engine man; one capable of repairing and keeping in first class condition, twenty White & Middleton gas engines, located in different parts of the State of New Jersey; state age, experience and salary expected. Wm. Simonds, 604 Stuyvesant Ave., Irvington, N. J.

NEW YORK

Mechanical draftsman with office and shop experience on automobile and general machinery, wants position at once. "E. M.," AM. M.

Superintendent, general foreman, experienced on automatic machine design, sheet metal drawing, screw machine work. Box 185, AMERICAN MACHINIST.

Any firm wishing to make their own die molded castings can obtain the services of a man who is thoroughly posted by addressing Box 155, AMERICAN MACHINIST.

Foreman, middle aged, now employed, modern ideas, steam pumps, electrical and general machinery; A-1 hustler; can handle force with skill. Box 158, AMERICAN MACHINIST.

Practical tool and diemaker, age 28, experienced at drawing, forming, bending and subpress dies, with executive ability, desires to make change; reference; energetic. Box 186, AMERICAN MACHINIST.

Machinist, 40, German, practical mechanical engineer, firm in drafting, designing and manufacturing of small machinery, dies, jigs, gages, pattern and all kinds of interchangeable work, brass or steel, wishes situation as foreman or any responsible position in any part of the United States. Box 172, AM. MA.

Superintendent; hustling, aggressive, economical; will raise plant to highest point of efficiency; proficient in speeding help, organizing facilities and producing highest grade of work at lowest cost; expert at tools, dies, fixtures, drafting; accurate estimator; past record will convince before closing. Address "D. F.," AMERICAN MACHINIST.

OHIO

As production engineer; tools, equipment, time setting; technical graduate; 12 years' experience. Box 183, AMERICAN MACHINIST.

Wanted—A position by man, 28, with nine years' experience in cost, production and timekeeping systems; able to systemize any shop; employed at present. Box 182, AM. M.

PENNSYLVANIA

An A-1 designer wishes change. Box 184, AMERICAN MACHINIST.

Draftsman, experienced on gas engines and producers up to 200 horsepower. Box 177, AMERICAN MACHINIST.

Cost accountant, 10 years in machine shops and foundries, desires to change; references. Box 162, AMERICAN MACHINIST.

Wanted—Position as draftsman; seven years' experience on special machinery and tools for interchangeable parts. Box 180, AMERICAN MACHINIST.

General foreman is open for a position as superintendent or general foreman; 32 years old, with good education; 12 years of experience as tool and diemaker on all kinds of tools and dies and manufacturing systems in the gun, adding machine and electrical line; guarantee to get results; correspondence to be mutually confidential. Box 120, AMERICAN MACHINIST.

WISCONSIN

Foreman of drafting and tool room, die and jig designer; expert on designing and making dies for automobile stampings, executive ability; American; 38. Box 123, AM. M.

General superintendent or works manager is open for engagement; high class and aggressive; good organizer and systematizer; can produce maximum results from minimum expense; advertiser is 42 years old, has had 20 years of successful experience as a mechanic and manager of manufacturing establishments. Box 131, AMERICAN MACHINIST.

FOR SALE

For Sale—Patented novelty; wonderful for mail orders. Box 168, AMERICAN MACHINIST.

Patent for Sale—Combination breast drill and valve grinder; very simple. Box 170, AMERICAN MACHINIST.

For Sale—Acme automatic screw machines, practically new; over supply of one kind only reason for selling; condition guaranteed—One No. 51, ¼ inch; one No. 52, ⅜ inch; one No. 53, 1 inch; one No. 54, 1½ inches; write for prices. Box 93, AMERICAN MACHINIST.

An opportunity to start a machine shop; we offer one of our departments for sale, the one used to establish our business; it is small and profitable work, but as we are devoting ourselves to heavier work, we offer to sell for $2000, all the drawings, patterns, and stock of finished and partly finished parts and rough material (inventories over $3000), circulars, electrotypes, special machinery and fixtures, and an established trade. Address Sipp Machine Company, Paterson, N. J.

Talks With Our Readers

By the Sales Manager

You remember the story charged up against Mr. Choate when he was ambassador in London. How one day he attended a buffet lunch, and a woman dropping an egg from a plate she was passing exclaimed, "Oh, Mr. Choate, I've dropped an egg, what must I do?" "Cackle," answered Mr. Choate.

We were reminded of this the other day at the meeting of the National Machine Tool Builders Association when a member asked what he must do to get his catalog into the hands of men buying and using his machines.

"Advertise," we felt like saying.

And a grinding-machine manufacturer asked the question too.

If there is any one subject that is hard to get information on—

If there is any one subject that our readers are more interested in—

It is grinding.

Our readers want this information; they are willing to pay if they can get it.

Who is in a better position to give it than a grinding-machine manufacturer?

Where is a better place for him to put this information than in his catalog?

Put it there. Tell the readers of the AMERICAN MACHINIST about it in their paper, and they'll send for the catalog quick enough.

This is true of all other lines—drilling, for instance, which, as Hoefer says, is one of the commonest of all shop operations, and one of the least understood.

Showing the catalog cover in your ad is all right, but showing what is inside is better.

And this is as it should be.

You are glad to swap your time for that of a salesman who while talking for his own machine is looking at the matter from your point of view, who can give you tips on your work, is sizzling with information.

The same is true of a catalog.

There's as much difference between an ordinary catalog and a selling catalog,—a treatise—as there is between an order taker and a real salesman.

Remember, ten catalogs asked for by interested men are worth a hundred sent to a list uninvited.

The AMERICAN MACHINIST is the automatic finder of buying brains in the machine-making field. Its subscription list is a self-correcting, up to date, practically wasteless list of the men who ought to have your catalog—men who influence the order blank and the check book.

They will read anything that will tell them interestingly how to do their work better, faster or cheaper—if it's told to them when they ask for the information.

They are giving more attention to advertising than ever before, and they appreciate that they are safer when buying advertised goods.

Show them you have something worth asking for, something of value and interest to them, and the problem of distributing your catalog will be solved.

* * *

Only reliable products can be continuously advertised.